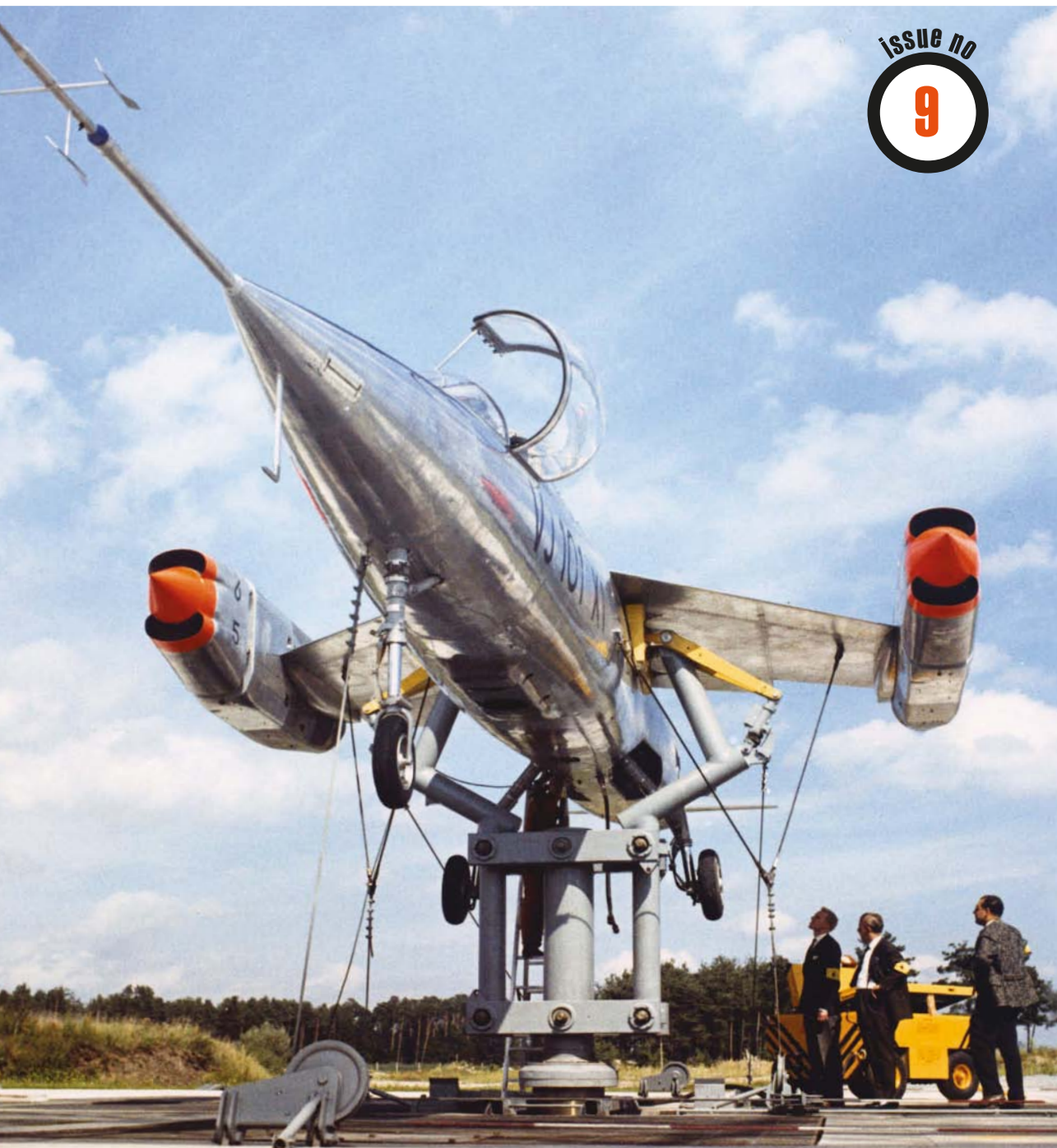


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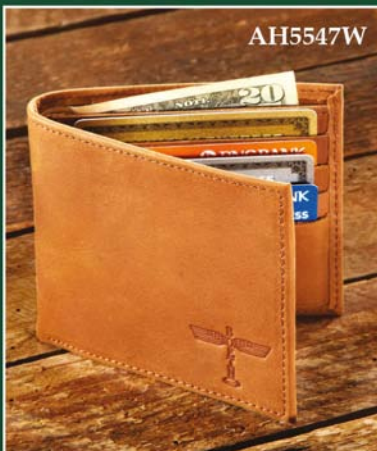
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## Editor's Letter

A VERY WARM welcome to our ninth issue, which I am delighted to report takes us into our third year of operations — thanks to the continuing faith and support of you, the *TAH* community, and of course the magnificent work of our world-class contributors. With your help, we're developing an ever-growing, intelligent, literate base for serious enthusiasts who want to dig deeper into a subject which still has so much to yield from its continually evolving narrative.

And so to *TAH9*, brim-full with revelations, epiphanies and unexplored treasures. Phil Vabre's detective story tracing the disappearance of Short Empire Flying Boat *Circe* in 1942 is an object lesson in sedulous research; as is the first part of David H. Stringer's dissection of the sprawling history of America's "non-sked" airlines, which also exhibits the work of one of the USA's greatest aviation photographers, William T. Larkins.

Ralph Pegram's in-depth investigation into the unbuilt 1930s monoplane designs of Henry Folland, using newly-discovered documents from the Royal Aero Club Trust archive, is worth the ticket price alone. Alan Griffith uses similarly obscure American official material to reveal 1941 US Army Air Corps plans for heavily-armoured "ramfighters" (using Bell P-39s and Curtiss P-40s), long before the Luftwaffe actually did it.

With stops at the 1914 air races at Shoreham, a tour of the majestic *Hindenburg* in 1936 and a roaring full-afterburner climb to 40,000ft in a Lightning, *TAH9* takes the reader on quite a voyage. It's good to have you aboard!

**FRONT COVER** *Encapsulating West Germany's post-war ambition to "do something challenging", the EWR VJ101C supersonic VTOL experimental jet fighter helped to put the nation back on the map technologically. The first prototype is seen here on the gyroscopic pedestal used for trials at Manching.*

AIRBUS CORPORATE HERITAGE

**BACK COVER:** *"Now Fly to Europe!" — a 1936 American Airlines promotional poster advertising joint services with Deutsche Zeppelin Reederei's mammoth Hindenburg airship.*

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100 years ago one of Britain's most promising aviators, Edward T. Busk, was killed flying a B.E.2c. Adrian Roberts profiles the brief life of a brilliant aeronautical pioneer

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# AIR CORRESPONDENCE



## Letters to the Editor

### The truth about UGLY

**SIR** — I can throw some light on UGLY (*The UGLY Truth?*, TAH8).

The USA used a system of what I call Destination Codes; often they appear on the Individual Aircraft Record Cards (IARCs).

Aircraft production was monitored closely, and Project Numbers were allocated to batches of machines for various locations or war theatres, often before the aircraft were built.

My serious research is all associated with the Consolidated B-24, but I assume that the system worked the same for all types.

When the aircraft were almost ready for shipping or ferrying to their destination, codes such as UGLY were allocated. For aircraft being transported by ship they were stencilled on the airframe, as illustrated in your article; but this was not done on aircraft which were flown to their destination — some B-24s are seen with a card taped inside the nose transparency.

The system was created so that aircraft would be directed to locations where they were most needed at any one time. It also meant that airframes off the production line would be sent to the appropriate Modification Centre to have the changes made to fit them for that specific theatre

or role. On arrival they would then get the more detailed modifications each Air Force required and then be sent as replacements to units.

The UGLY code meant "Britain, Europe, Eighth AF", later replaced by SOXO "Europe, Eighth AF".

There was a complete alphabet of codes. OBEY was "Thirteenth AF", LEFT was "Brisbane, Fifth AF" etc.

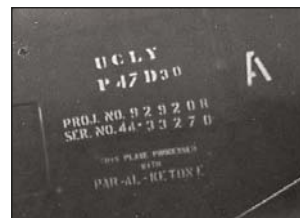
**Bob Livingstone** Brisbane, Queensland, Australia

### Striking multiple chords

**SIR** — You certainly know how to keep someone quiet for a few days! TAH7 was an excellent issue, ping-pong all sorts of things.

Beverley (*Send in the Heavy Mob!*): I was taught everything I know about flight test by an Indian bloke, Neil Naidu, who had previously worked on the Beverley. He said that using the cross (grass) runway at Brough, at right-angles to the Humber, was always "interesting". I flew there in 1997 in a Slingsby T-67M Firefly, where the main runway was interesting enough with Robert Blackburn's office built across the end of it — but the cross runway, now a nature reserve, looks ridiculous!

Tube Merlin (*It's Quicker by Tube*): There was quite a lot in the RR Heritage Trust magazine a



**ABOVE** Remember the puzzling code "UGLY", seen here stencilled on a P-47D at Liverpool Docks, published in TAH8? Subscriber Bob Livingstone has provided chapter and verse — see his letter on this page, and see if you can spot the "Ford — Soxo" code pencilled to the right of the aircraft's name on Eighth Air Force B-24 Sultry Sue at LEFT.



Sparked by our Tube Merlin article in TAH7, subscriber Graham Skillen (see his letter on this spread) sent in these three photographs which he took at Reno in 1965. The main picture shows newly-arrived North American P-51D Mustang N335/Race 14, winner of the Trans-Continental Air Race. Note the burnt-through starboard exhaust stack, shown in detail BELOW LEFT. Unmodified Mustang N2869D is reflected in the wet runway BELOW RIGHT.



year or so ago about speedboat improvements to engines. I was at Reno in 1965 for the end of the Trans-Continental Air Race in a sheeting thunderstorm, so see my photograph of the unmodified N2869D on arrival. The winner was N335/14, complete with burnt-off exhaust stack. Today seeing seven or eight Mustangs is no great deal, but for a UK-based enthusiast it was truly fantastic having all these wonderful aircraft rumbling in out of the mist. Yes, it does rain in Nevada!

U-2 (*The Dragon Lady Goes to Sea*): I did know one of the UK U-2 pilots quite well. Basil Dodd worked for the CAA in the mid-1980s when I was there. I knew he was an RAF U-2 pilot, but it was never regarded as a conversational subject, for obvious reasons, more's the pity.

**Graham Skillen** North Cheriton, Somerset

## Limited recycling opportunities?

**SIR** — I have just finished reading TAH8, and would like to comment on the article *Pemberton Billing and the Four-Winged Farrago*.

On page 37 it is suggested that parts of the tailplane and wings of the P.B.29E could have been incorporated into the P.B.31E. While this is certainly possible, the photographs of the P.B.29E crash held by the Southampton Museum, albeit very poor quality "box Brownie" snapshots, show the level of wreckage to be quite comprehensive. The whole centre section, upper gun position and engine mounts had collapsed completely, possibly as a result of undercarriage failure, leaving the fuselage resting nose-down and twisted at more than 90° to the right on top of the mangled remains. The outer wings had all torn free, the starboard set lying on their leading

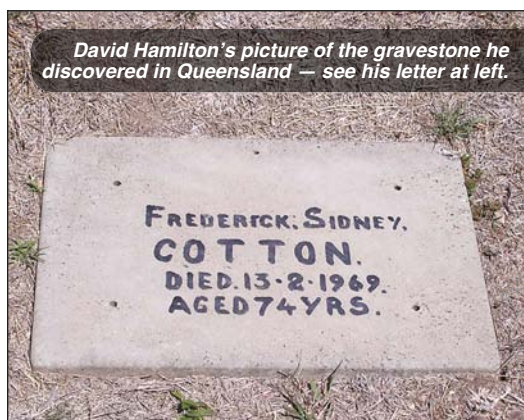
edges and the port set twisted and broken; all were damaged to a greater or lesser extent. Thus the tail was the only part left undamaged, and it is very different in shape from that fitted on the P.B.31E. If anything was salvageable it was not as major components, probably just ribs and spar sections.

**Ralph Pegram** via e-mail

### Cotton conundrum

**SIR** — Your article on Sidney Cotton (*Gun Cotton, TAH4*) reminded me that I had taken a photograph of his grave. My wife and I were on a bird-watching holiday in Queensland and the subject of Cotton came up as our guide was a keen aviation buff. He took us to a small patch on a hill, by a back road miles from anywhere, containing about half a dozen graves. A rather sad resting place for the man who flew the last aeroplane out of Germany having secretly taken many photos of important targets for the RAF and then started the Service's Photographic Reconnaissance Unit.

**David Hamilton** North Rocks, NSW, Australia  
[Australia's main monument to Sidney Cotton is a plaque on the family plot at Tallegalla Cemetery in Brisbane, where his ashes were buried following his death in London. So what is the true significance of the stone in the accompanying photograph? Can anyone shed more light? — Ed]



David Hamilton's picture of the gravestone he discovered in Queensland — see his letter at left.

### Exhaustive analysis

**SIR** — Having read your good piece on Hurricane G-AMAU (*The Last of The Many: The Racing Years, TAH5*), I have an observation: on page 30 you say the aircraft is shown at the 1950 King's Cup Air Race (KCAR) and again on page 31. But on page 30 it has a bank of six exhaust stubs each side, while on page 31 it has the three "Siamese" coupled exhausts; and on page 32 it's back to the six-bank? I think the answer is in the second column of page 30 — the 9gal tank installed in the leading edge of the port wing was left aluminium, which can't be seen in the pic on page 31, so I'd suggest this was taken before the KCAR and the replacement of the coupled exhaust with the individual ones.

Incidentally, I do possess a (not very good quality) colour image sent to me by the late David Lockspeiser of G-AMAU alongside one of the reconditioned Sea Furies awaiting delivery to Burma at Hawker's Squires gate factory at Blackpool. He had some nice anecdotes about flying the aircraft, using it mainly as a hack to get between Dunsfold and Squires Gate, including one that echoes the incident on page 37 of encountering a BBMF Spitfire somewhere over the Midlands and, sans radio, engaging in a brief playful mock dogfight before waggling their wings and continuing on their respective courses.

Just to be pernickety, Swordfish NF389 wasn't the "final" Swordfish as stated, although it was, at that stage, the last airworthy Swordfish and indeed would be the last of the type to see service on the military register before G-AJVH was restored by Fairey (Sir Richard having seen NF389 reputedly at RNAS Ford and decreeing that "their" Swordfish ought to be restored . . .).

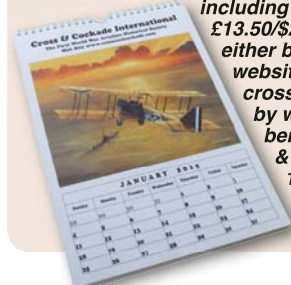
**Lee Howard** Street, Somerset

[Thanks for this. Interesting stuff about

## A Flying Start to the Day

**HOW PLEASANT**, in a gloomy, overcast January, to be greeted each morning by Paul Monteagle's study of a D.H.6 flying into a glorious sunrise, or, on a dark December evening, to behold a Short 184 against a glowing sunset, rendered by David Ellwood. These are just two of the 12 splendid and well-reproduced artworks comprising *Cross & Cockade International's* calendar for 2015, now available to members and non-members alike.

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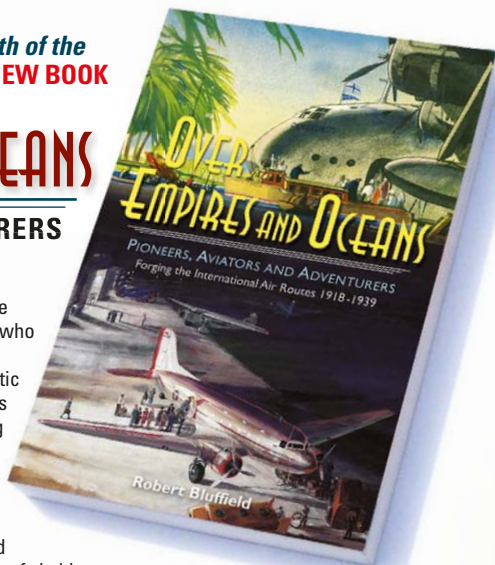
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Potez 840 F-BMCY, complete with bent inner propeller blades, at Sumburgh — see George Jenks's letter on this page.

G-AMAU! Talking to John Havers, who took the pic on page 32, he says it can't be at Wolverhampton (1950 KCAR) as stated because he's never been to Wolverhampton and was celebrating his brother's 21st birthday on that day! Your points about the exhaust stubs are spot-on too, so I suspect that the pics on pages 30 and 32 were taken after the installation of the Merlin 24 in August, possibly at Swansea where the Goodyear Trophy race was flown and in which 'MAU also wore No 41. The pic on page 31 of TLOTM in a turn probably is from the KCAR in June 1950, pre-engine change. There was a certain amount of guesswork with the pics, as, although my father (the late Mike Stroud, whose collection now constitutes the TAH Archive) kept plenty of G-AMAU pics and in the right chronological order, most of them had nothing written on the backs. At least one of them (page 36) had me tied up in knots as I simply couldn't reconcile the racing number with the colour scheme and the date! — Ed]

### Shetland Potez

**SIR** — Regarding the *Elegant Imperfection* article about the Potez 840 in TAH6, we thought you might like this photograph from our collection, showing F-BMCY at Sumburgh. Presumably it was put back on its undercarriage before its final dismantling, although we don't have the date. One of our crew took it whilst on 748 work there.

**George Jenks** Manager, Avro Heritage Centre, Woodford Aerodrome, Greater Manchester

### Pay to see the monster

**SIR** — Following on from *An Airship Interlude* in TAH4, I thought you might like the accompanying photograph of the AD 1 which someone has sent me. It shows the ship moored out at Capel and on display to the public for 6d a look, children half price. You can just see the top of the airship shed over the top of the trees to the right. I assume the shed was full of buses, hence the mooring-out. Pity we didn't have the photo for the article.

**Brian Turpin** Debden Green, Essex



**Wonder how many paying customers the AD 1 airship's owners got, considering you could apparently just climb up the bank and view it for nothing? See Brian Turpin's letter on this page.**

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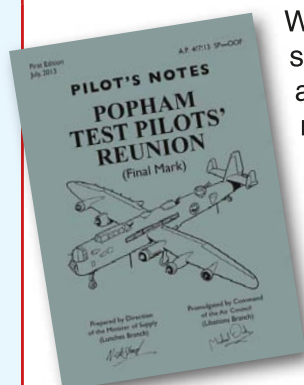
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In February 1942, as the Japanese war machine pressed relentlessly southwards, Qantas Short Empire Flying Boat *Circe* vanished while on a flight from Java to Broome. **PHIL VABRE** tells the dramatic story of *Circe*'s last flight, its aftermath and how recent research has finally solved a 72-year-old mystery

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# LOST WITHOUT TRACE?



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**I**N TJILATJAP, the only large port on the southern coast of Java (and now known as Cilacap in modern Indonesia), the morning of Saturday February 28, 1942, dawned fine, as is so often the case in the tropics before the heat and humidity of the day combine to trigger cumulus cloud build-ups and thunderstorms in the afternoon. The calm of the morning belied the fact that Tjilatjap was in fact at the centre of a maelstrom that was engulfing south-east Asia and the Pacific.

In just three months from the beginning of December 1941, Imperial Japanese forces had routed the British and Australian armies that had been in Malaya, and American forces in the Philippines and western Pacific. Now, in a huge pincer movement, Japanese forces were closing in on Java, the last remaining bastion of colonial prestige in the Netherlands East Indies (NEI). In the west, the supposedly impregnable Singapore had fallen a week earlier and Japan had already begun the conquest of Sumatra. In the east, the Japanese had come down through Borneo, and occupied Timor and the tropical paradise of Bali.

The eastern pincer had also had the effect of cutting off virtually all air transport between Australia and the remaining part of the NEI still in Allied hands. Most of the aircraft available simply did not have the range to do anything but hop down the island chain of what is today Indonesia to Timor, before making the relatively

short ocean crossing to Darwin. Some of the few aircraft that could tackle a longer crossing were the elegant pre-war Short S.23 Empire Flying Boats, six of which were now stranded at the eastern end of the famous "Horseshoe Route" between Sydney and South Africa, in the hands of Qantas Empire Airways.

Known as "C-Class" flying-boats because they were all given names beginning with that letter, the four-engined Empire 'boats were the "Jumbo Jets" of their day. In happier times they formed the basis of the Empire Air Mail Scheme, an imaginative plan to improve communications throughout the British Empire by drastically reducing the cost of sending mail by air. Now, in wartime, they were Australia's sole heavy-lift air transport assets.

A month earlier a Qantas-operated Empire flying-boat, G-AEUEH, named *Corio*, had been attacked and shot down by Japanese fighters off Timor. As a consequence, the Australian Department of Civil Aviation (DCA) ordered Qantas to find a more westerly route to connect Australia with Java and beyond. Qantas and the DCA quickly settled on Broome, on Western Australia's remote Kimberley coast, to Tjilatjap. A few feverish weeks followed during which DCA and Qantas personnel laboured strenuously to prepare suitable facilities at Broome for the big flying-boats. It was a period of hardship and hard labour, hampered by inadequate equipment, lack

**Short S.23 Empire Flying Boat G-AETZ (c/n S.842), named *Circe*, has its port outer Bristol Pegasus engine run up at Imperial Airways' maintenance base at Hythe before the war. The aircraft made its first flight on August 16, 1937, and operated its first commercial service the following month. By November 1941 it had been put into camouflage.**

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Another image of Circe in happier times — G-AETZ taxis away from Southampton's Berth 108 at the start of a pre-war Empire Air Mail Scheme voyage to Australia or South Africa. Behind, the Union-Castle Line's RMMV Capetown Castle also readies for another, much slower, journey to South Africa.

PHILIP JARRETT COLLECTION



of suitable boats, a spell of cyclonic bad weather and the enormous tidal range in Broome harbour.

Finally, sufficient facilities were in place to receive the first flying-boat, but it was not until Friday, February 13 that G-AETV *Coriolanus* was able to fly in from Darwin. Even then, the sea state was so bad that only half of its crew could be taken off by dinghy before dark, and refuelling was not even attempted. Two more full days were to pass before *Coriolanus* could be fully fuelled and made ready for departure, and it did not leave Broome for Tjilatjap until the morning of Monday, February 16.

This marked the start of a hectic fortnight for Qantas and the DCA, with a pattern becoming established of one — later two — flying-boat departures from Broome each day on the 9hr trip to Java. After a night at Tjilatjap the flying-boats would return, crossing with that day's outbound boats. Loads taken to Java were military personnel and urgent military freight but return loads were mostly civilians, largely women and children, fleeing the Japanese invasion. In the middle of that week another significant event occurred: the first air raid on Darwin, on February 19.

With every day the danger increased. The confused military situation in the NEI and poor communications back to Australia meant that those controlling the operation — Qantas Superintendent of Flying Capt Lester Brain on the spot in Broome, and Qantas and DCA headquarters in Sydney and Melbourne respectively

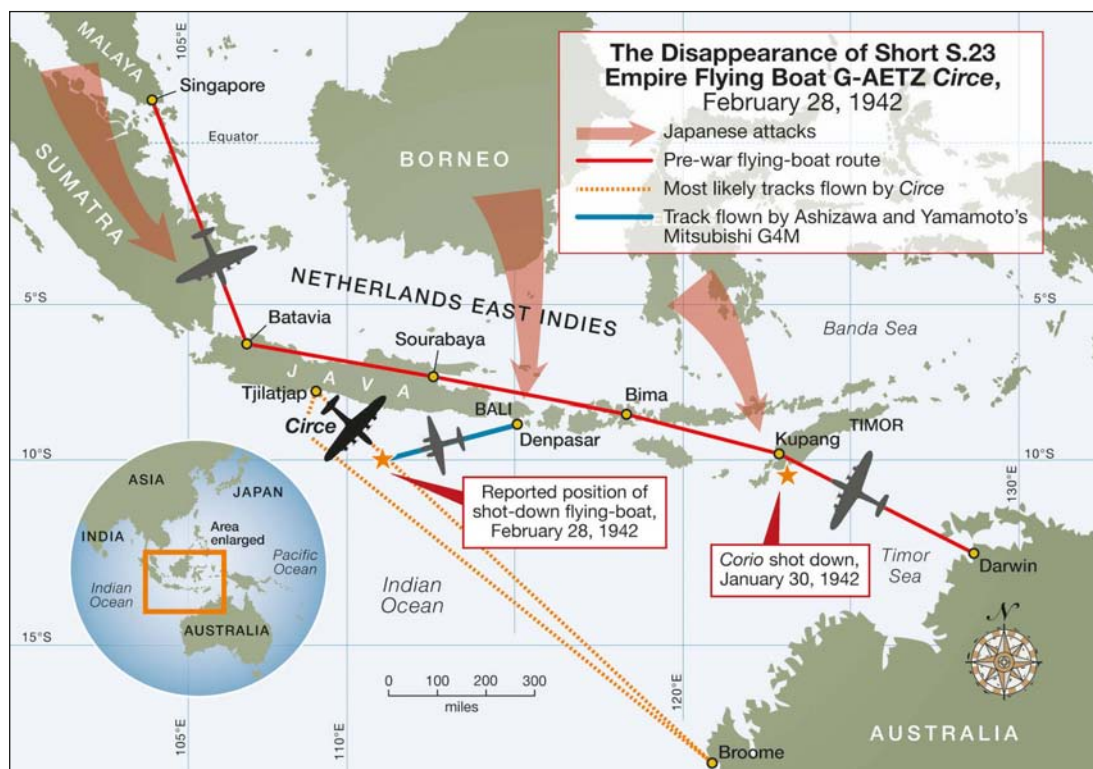
— had little accurate knowledge to work with. By the middle of the second week, news from Java suggested that it would be reasonably safe to continue operations until the end of the week, but that trips would probably need to be suspended after that or risk losing another of the valuable flying-boats. On Wednesday, and again on Friday, hard work enabled the despatch of two Empires from Broome.

#### CIRCE'S DEPARTURE

Thus, at moorings on that deceptively calm Saturday morning in Tjilatjap harbour, rode two of the remaining Empire flying-boats; G-AETZ *Circe* (pronounced "sersi") and G-AEUF *Corinthian*. Both had arrived at Tjilatjap in the relative safety of the previous afternoon with instructions to evacuate as many people as possible to Broome. Captain Stephen Howard of *Corinthian* elected to spend the night ashore at a rest house run by the Javanese authorities for visiting aircrews, but Acting Captain William "Bill" Purton of *Circe* chose to spend the night aboard his flying-boat.

Bill Purton had joined Qantas as a First Officer in April 1935 and was one of a small group of Qantas pilots transferred to the Royal Australian Air Force (RAAF) in October 1939 on the outbreak of war in Europe. He returned to Qantas at the end of October 1941, when a route extension by Qantas from Singapore to Karachi resulted in a need for more pilots. Now, barely four months later, he found himself nevertheless in the combat





zone. Recently promoted to Acting Captain, the 29-year-old boyish-looking Purton had already operated one Broome—Tjilatjap return shuttle as Howard's First Officer on February 24–25. Following a day's rest and his first trip to Tjilatjap as captain, he was preparing to return to Broome.

Tjilatjap was a dangerous place to be. Although it was not to be bombed for nearly another week, Japanese reconnaissance aircraft operated over the town every day. The previous day the US Navy seaplane tender *USS Langley* (AV-3), carrying 32 Curtiss P-40 fighters for the defence of Java, was bombed by land-based Japanese Navy aircraft some 75 miles (120km) south of Tjilatjap. The accompanying freighter *Sea Witch* managed to deliver its cargo of a further 27 crated P-40s to the Tjilatjap docks, but the badly damaged *Langley* had to be sunk by the destroyer *USS Whipple* (DD-217). Zero fighters attacked two Dutch Consolidated Catalina flying-boats on anti-submarine patrol over the *Langley*, shooting one down.

After a very early breakfast at the rest house, Capt Howard went to the wharf where he met *Circe's* First Officer, Mervyn Bateman. A New Zealander, Bateman had joined Qantas as a flight clerk in 1938 although already qualified as a pilot. The following year he was seconded to the RAAF, probably as an instructor at No 4 Elementary Flying Training School at Mascot. In July 1940 Bateman married Winifred Gillespie, one of the few Australian women to hold a "B"

(commercial) pilot's licence in those days. The Batemans also had a baby daughter, Jenny.

Together Howard and Bateman boarded a motor launch that took them out to the flying-boats in the harbour. Overnight much of the shipping in the harbour had left and by dawn the waterfront was almost deserted. The first stop for the launch was *Circe*, to drop off Bateman. Howard, who knew Purton well, saw him there and they exchanged greetings before the launch headed for *Corinthian*.

At *Corinthian*, Howard and his own crew, which included First Officer John Connolly, made the aircraft ready for departure. This aircraft, whose load included most of the remaining Qantas staff still in the NEI, was the first to start engines and taxi in the weak dawn light. Airborne at 0838hr Australian Eastern Standard Time (AEST — 0538hr local time), Howard had to conduct a tight circuit to bring the big Empire flying-boat on to its initial course. As they swept over the harbour, Howard and Connolly noticed *Circe* taxiing away from its moorings and preparing to take off. Howard estimated that it would probably also be airborne within the next few minutes.

## EN ROUTE

Aware of the danger from prowling Japanese fighters, Howard set course directly out to sea for the first 75 miles (120km), intending to put significant distance between *Corinthian* and Java as quickly as possible. As Connolly later wrote:



**ABOVE** Three of the crew on *Circe*'s last flight. From left: Capt Bill Purton, who joined Qantas in April 1935 and served with No 11 Sqn RAAF in New Guinea before returning to Qantas in October 1941; First Officer Mervyn Bateman, who qualified as a pilot in New Zealand; Radio Officer Herbert Oates, who joined Qantas in early 1939.

"We flew due south for some time after take-off in order to put plenty of water between us and the shipping which we judged was due for a pasting that morning". Although they had not discussed it as they passed the time of day earlier, Howard was confident that Purton would follow the same course. After all, Howard and Purton had flown the Broome—Tjilatjap shuttle together in *Corinthian* two days earlier.

Apart from a light haze over Java itself, the day was fine and visibility clear, which in the circumstances must have made those aboard the two Empire 'boats somewhat nervous. At 1009hr AEST (0909hr in Broome, 0709hr Java time) *Circe*'s Radio Officer, Herbert Oates, passed a routine message to Broome radio for Lester Brain. For security reasons, as per Qantas practice at this time, Oates used the callsign "TZG", made up of the last two of *Circe*'s registration letters, G-AETZ, followed by the first letter. The message, sent in

code, read: "Total 25 passengers. Tell Orm arrive not before 4 p.m and carrying engineer". Orm Denny was the captain of G-AETV *Coriolanus*, due to set out from Broome for Tjilatjap that morning. The Broome radio operator, Mr J. Gornall, was unsure about correct reception of the second code group, the number of passengers, and attempted to confirm the message with *Circe* but was unable to obtain any reply.

After decoding the message, Brain advised Gornall that it had been received correctly, but he was wrong. In fact *Circe* was carrying only 16 passengers, including a party of Dutch diplomats formerly stationed in Malaya and their families, as well as a Sarawak diplomat, some BOAC personnel and a US Navy officer.

Aboard *Corinthian*, Howard also overheard the message from *Circe* and instructed his own radio officer to attempt to contact *Circe*, but he was not successful in establishing communications.



**Short S.23 G-AEUF (c/n S.848), named Corinthian, left Tjilatjap a few minutes ahead of *Circe* on February 28, 1942. Although it survived that day, it was destroyed in an accident while alighting at Darwin three weeks later.**





**ABOVE** In camouflage with fin flashes and red, white and blue identification stripes beneath the registration, *Circe* awaits its next voyage at the Qantas terminal at Rose Bay, Sydney, in November 1941. Unarmed and carrying civilians, the *Empires* were still targets for Japanese fighters, as the loss of *Corio* on January 30, 1942, proved.

*Corinthian's* radio officer continued to try to contact *Circe* at intervals throughout the remainder of the flight, but to no avail. First Officer Connolly recalled: "We saw nothing during the crossing except two Japanese submarines cruising on the surface in the direction of Koepang [now Kupang, Timor]. Some 300 miles [480km] out from Tjilatjap, however, some of our passengers declared emphatically that they could see aircraft to starboard and sent the purser up to tell us so". Searching to the south, Connolly and Howard could not see any aircraft themselves and put the source of their understandably tense passengers' alarm down to some dark cloud in the distance.

*Corinthian* alighted on Broome harbour at 1728hr AEST after a flight of nearly nine hours. Although it should have been close behind, *Circe* did not follow. As time wore on, those anxiously awaiting *Circe's* arrival at Broome increasingly turned their minds to the inevitable conclusion:

the aircraft had gone missing. With considerable understatement, Lester Brain wrote in his diary, "This news is ominous".

#### EVENTS IN BROOME

Earlier in the day, Capt Orm Denny had departed Broome in *Coriolanus* on what had been planned as the final Tjilatjap shuttle. His instructions included evacuating the remaining Qantas staff in Tjilatjap. However, just a few minutes after *Coriolanus* took off a telegram arrived from the DCA in Melbourne instructing Brain to recall all machines west of Broome. Denny was immediately radioed with this instruction and *Coriolanus*, perhaps fortunately, turned back. With Denny back in Broome and no more civil flying-boats to go across to Java, Brain went to see the American commander in Broome, Colonel Perrin, who agreed to send an instruction to Java for the Qantas staff to be brought to Broome

**A rare photograph of G-AETV *Coriolanus* being refuelled from the demasted pearling lugger *Gerardo* at Broome during the fortnight of shuttle services to Tjilatjap. Trapped in Australia, *Coriolanus* was transferred to the Australian register as VH-ABG in August 1942, and became the only *Empire* flying-boat to survive the war in Australia. It was finally retired in January 1948, the last airworthy *Empire* Flying Boat anywhere in the world.**

QANTAS HERITAGE COLLECTION



aboard a USAAF bomber, several of which were still making risky flights to and from Java.

Over the preceding week, Broome had become the scene of intense aviation activity as the Australian centre of the air evacuation efforts from the NEI. Flying-boats and landplanes, civil and military, and of several nationalities, were congregating there. At times, up to 30 aircraft could be found in Broome at once, divided between the harbour and the aerodrome.

With *Coriolanus* back in Broome, *Corinthian* and hopefully *Circe* due in that day from Java, and G-AEUB *Camilla* and G-AEUC *Corinna* due from Sydney that day and the day after respectively, virtually the whole operational Qantas fleet would be congregated in Broome. It was clearly a prospect that worried Lester Brain, who was well aware that the Japanese could easily intercept the radio traffic associated with all this air activity. Determining to get the Qantas aircraft out of Broome as quickly as possible, he noted in his diary: "I shall not be surprised if all this activity brings an enemy raid". It was a prescient thought.

That afternoon, Capt Frank Thomas arrived as expected in Broome from Sydney in *Camilla*. Later in the day, after Howard's arrival from Tjilatjap was not followed as expected by Purton in *Circe*, Brain again went to see Perrin. The latter had a number of aircraft proceeding to and from Java the following day, and agreed to instruct the crews to keep a lookout for *Circe* en route. With communications between Broome and Java virtually non-existent, Perrin also arranged for his crews to make enquiries in Java as to its whereabouts. That night, the Japanese invaded northern Java.

### SEARCH WITHOUT RESCUE

The following day — Sunday, March 1 — Capt Howard departed in *Coriolanus* for Sydney via Wyndham. The refuellers and marine staff in Broome must have been working hard, as a second Empire 'boat was despatched that day; Orm Denny in *Corinthian* also left for Sydney, routing via Darwin. However, following the departures, not one but two Empire flying-boats arrived. First was the expected Capt Eric Sims in *Corinna*, who had left Darwin that morning. The second to arrive was the RAAF's A18-10 of No 33 Sqn. This was the former Imperial Airways 'boat *Centaurus* (G-ADUT), which had been the very first Empire flying-boat to visit Australia, in 1937. Its skipper on this occasion was former Qantas pilot Flt Lt Keith Caldwell, with copilot Fg Off Fred Derham. For the last month, this aircraft had been engaged on transport and latterly evacuation flights into the NEI, including Timor and Ambon Island.

None of the aircraft arriving in Broome from Java that evening brought news of *Circe*. Feeling



QANTAS HERITAGE COLLECTION

**ABOVE** Lester J. Brain AFC joined Qantas in 1924, becoming the airline's chief pilot in 1930. Appointed Flying Operations Manager in 1938, Brain master-minded Qantas operations in support of the Australian military throughout World War Two, and later became the Managing Director of de Havilland in Sydney.

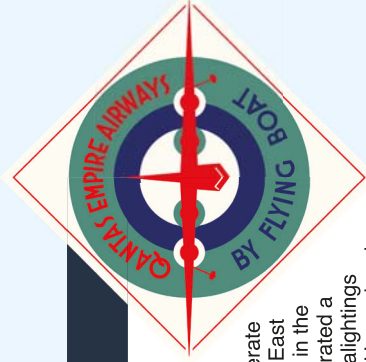
that they could not just abandon Broome without making some effort to search for *Circe*, Brain instructed Captains Frank Thomas and Lew Ambrose to take *Corinna* the following day to search for about 500 miles (800km) out to sea. Some 10hr of searching by Thomas and Ambrose in *Corinna* produced no hint whatever of the fate of *Circe*. In the circumstances it was not justifiable to keep searching and it was decided to despatch *Corinna* eastbound after refuelling at high tide the following morning, Tuesday March 3. It was to be a fateful delay.

*Corinna* was still at its moorings, alongside A18-10 and 14 other flying-boats, including four Catalinas and six Dorniers of the Dutch naval air arm packed with civilian refugees, when Japanese Zero fighters operating from Timor strafed the harbour at 0930hr local time. All the flying-boats were set ablaze and sunk amid much chaos and tragedy, as well as other aircraft destroyed at the land aerodrome.

It was a catastrophe, following hot on the heels of the shattering first air raid on Darwin 12 days earlier. In the aftermath of the Darwin and



## SHORT S.23 EMPIRE FLYING BOAT G-AETZ CIRCE



SHORT S.23 EMPIRE Flying Boat G-AETZ *Circe*, c/n S.842, was the 19th of its type and was delivered to Imperial Airways on August 16, 1937. In Greek mythology *Circe* is the sorceress in Homer's epic poem *The Iliad*, who turns Odysseus's crew into swine during their journey home from the Trojan War. In August 1940 registered ownership of G-AETZ was transferred to the newly-formed BOAC.

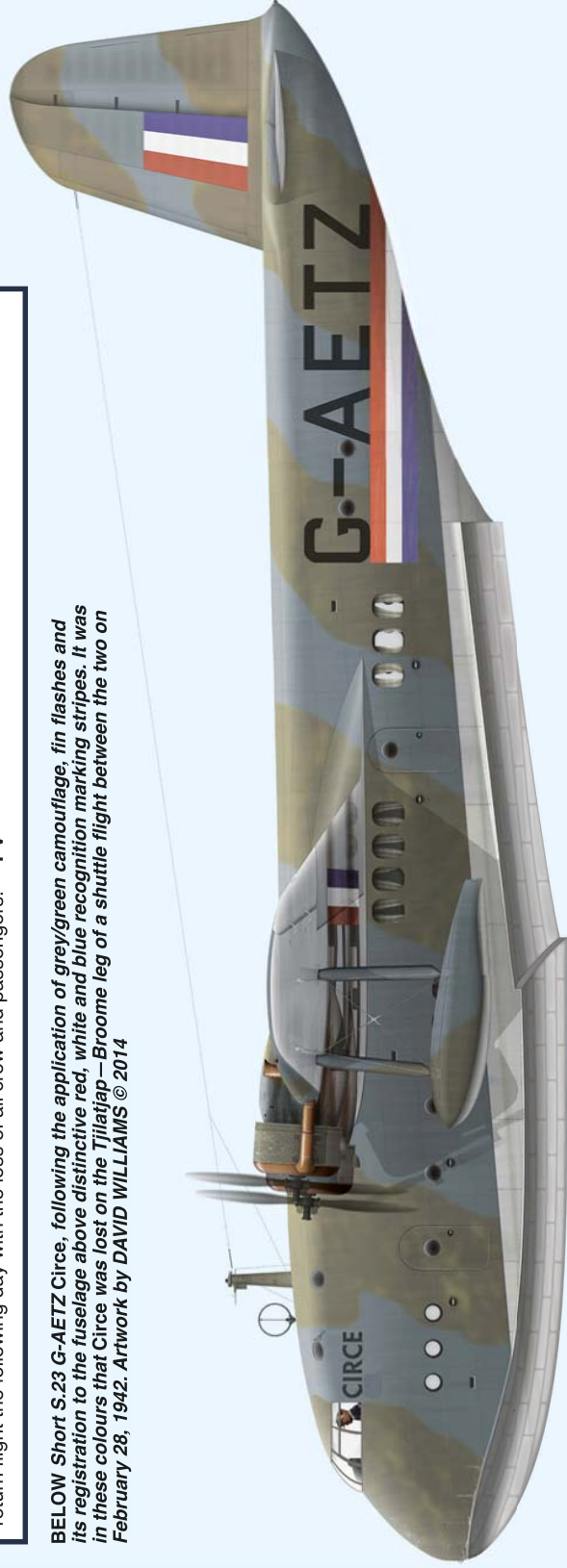
In January 1942 a Qantas crew under Capt Steve Howard with First Officer Mervyn Bateman took over *Circe* to operate the final section of Horseshoe Route service NE155 ("North then East") from Calcutta in India to Batavia in the Dutch East Indies (now Jakarta, the capital of Indonesia). They flew down the alternative western bypass route through Port Blair in the Andaman Islands and Sibolga in North Sumatra, dodging Japanese air raids along the way. On January 22 *Circe* operated a Batavia—Singapore—Batavia shuttle under Capt Bill Purton with First Officer John Connolly, making two emergency alightings on the inbound flight to Singapore owing to air-raid alerts. The following day *Circe* continued NE155 to Sydney under Howard and Bateman, arriving on January 26.

After a delay caused by the need to move operations westward from Darwin to Broome, *Circe* left Sydney operating service WS162 ("West then South"), arriving in Broome on February 21. By this time the Horseshoe Route had been cut and *Circe* instead operated the first Broome—Tjilatjap—Broome shuttle under Capt Orm Denny during February 22–24. Denny made another shuttle flight in *Circe* on February 25–26, carrying a cargo of 3,750lb (1,700kg) of machine-guns to Java and bringing back a full load of evacuees.

On February 27 *Circe* again operated the Broome—Tjilatjap shuttle under Capt Purton but the flying-boat was shot down on the return flight the following day with the loss of all crew and passengers.

PV

**BELOW** Short S.23 G-AETZ *Circe*, following the application of grey/green camouflage, fin flashes and its registration to the fuselage above distinctive red, white and blue recognition marking stripes. It was in these colours that *Circe* was lost on the Tjilatjap—Broome leg of a shuttle flight between the two on February 28, 1942. Artwork by DAVID WILLIAMS © 2014





**ABOVE** Photographs of *Circe* are comparatively rare; this example, taken at an unidentified location before the flying-boat's adoption of camouflage, shows a mooring rope being thrown to the Radio Officer, who is standing in the bow mooring hatch. The aircraft's captain would supervise the mooring process from the cockpit above.

Broome attacks, and other critical developments in the Pacific War soon afterward, the unresolved disappearance of *Circe* quickly faded from the public consciousness.

### THE AFTERMATH

Because of the uncertainty about the fate of *Circe*, the members of the crew were not officially declared as "presumed dead" until after the war — which was a source of considerable distress to Bateman's widow in particular. Bill Purton was already a member of the RAAF Reserve, but in 1943 Bateman was posthumously appointed to a Commission in the RAAF Reserve as a Flying Officer, effective from February 27, 1942, so that his widow could claim a war-service pension for herself and their young child — but only if his death was officially confirmed. Oates and Hogan were also posthumously commissioned as Pilot Officers. Bureaucratic arguments over the pension rights of Mrs Bateman dragged on for years. Qantas supported her in the meantime out of advances on an insurance policy for its pilots but refused to continue paying a salary on the not unreasonable ground that he was, in all probability, dead.

Arguments also continued over the insurance for the crew and the flying-boat itself. The situation was complicated by the fact that the aircraft had been chartered from the Commonwealth government through the Australian DCA on an

extraordinary verbal contract with American airline Pan American World Airways, which was acting on behalf of the US War Department. Harold Gatty, an Australian who had made his name as navigator for Wiley Post in their 1931 circumnavigation of the world, brokered the contract. In 1942 Gatty occupied a somewhat ambiguous position, holding a commission as a group captain in the RAAF but working for the USAAF in Australia and being employed by Pan Am. As it turned out, the details of the contract were not set down in writing until after the conclusion of operations into Java.

The Empire flying-boat charter was made possible by the severing of the Empire Air Route between Australia and India, and was principally for the transport of American military personnel and cargo. Furthermore, although being operated by Qantas on an interchange agreement at the time of its loss, *Circe* was actually owned by BOAC. Under the charter agreement, Pan American accepted full liability on behalf of the War Department for loss or damage owing to enemy action to the extent of £50,000 sterling per aircraft. Pan American and the American government were not responsible for insurance on the death or injury of crew members.

*Circe* was insured for normal risks on a joint BOAC/Qantas combined fleet policy at a value of £50,000 sterling. But since the most likely cause of its loss was enemy action, the insurer, the



British Aviation Insurance Company Ltd (BAIC), not surprisingly sought to limit its liability. The Commonwealth also refused to accept any liability, stating that the onus was on BAIC to prove that *Circe* had been lost through enemy action. This was a view that BAIC found difficult to accept since it was obviously impossible in the circumstances to prove anything, one way or the other. As a consequence, BAIC refused to continue providing insurance for Qantas flying-boats. The insurer also noted that neither it nor the aircraft's owners (BOAC) were aware that the aircraft had been chartered to the US War Department, and that this non-disclosure contravened the provisions of the policy.

The claim for *Circe's* loss was eventually bundled up with the total claims for payment for the Tjilatjap shuttles, including operating expenses and *Corinna's* loss at Broome. The Commonwealth acted as a go-between in negotiations with the American authorities. A bureaucratic to-and-fro continued for two years, with an increasingly frustrated Qantas complaining bitterly of the delay taking place in the settlement of the claim. Finally, in April 1944, the Commonwealth paid Qantas out for the operating expenses and for *Corinna*, the destruction of which at Broome was incontrovertibly due to enemy action. The Commonwealth then continued with action to recoup the money from the American government. The claim was finally paid out in February 1946. However, the settlements specifically excluded *Circe* since the American government also denied liability on the basis of a lack of evidence that *Circe* had been shot down.

Meanwhile, in 1945, BAIC reached a settlement with BOAC for the loss of *Circe*, in the process acquiring the right to pursue the American government for the debt if it could be proven that *Circe* had been shot down. It seems that BAIC launched a research project in the large collection of archival material acquired in the USA during and after the war to find evidence of *Circe's* fate. The insurance company then put together a lengthy submission setting out the circumstances of the war at the time and such evidence as could

be found relating to *Circe*, which was not much. In 1948 BAIC approached the DCA in an attempt to get the Commonwealth to support its claim against the American government. Once again, years of to-and-fro followed before, in September 1950, fully eight and a half years after *Circe's* disappearance, the Commonwealth informed the insurer that it declined to become involved.

And there, it seems, the matter has rested these last 64 years. But there was one tiny clue hiding in the BAIC submission to the DCA that would finally allow the fate of *Circe* to be discovered.

## RESURRECTION AND RESOLUTION

For more than 70 years the disappearance of *Circe* has been a historical footnote, just one tragedy in a catalogue of disasters that shook the western Allies in the early part of 1942. Although circumstantial evidence strongly underpinned the general assumption that *Circe* was shot down by Japanese fighters, no direct evidence had ever been found to confirm this supposition.

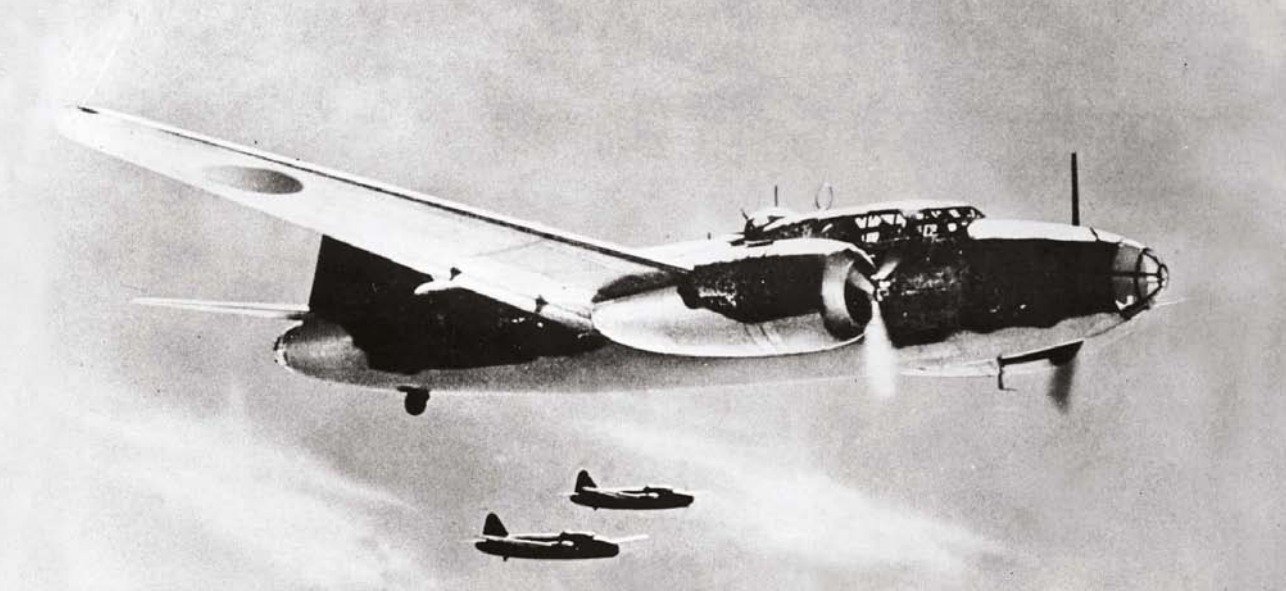
At the beginning of 2012 the author set out to write a book about the charismatic Empire flying-boats operated by Qantas. Of course, I knew the outline of the *Circe* story and I was quickly able to find some files in the National Archives of Australia that enabled me to put some flesh on the bones of the story. But there was still no evidence of what had happened to the flying-boat. The most likely candidates seemed to be fighters from a Japanese aircraft carrier, four of which were known to be operating in the area around Java at the time, subsequent to their savage attack on Darwin on February 19, 1942.

Significantly, the files did contain statements from various participants that gave times for certain important events, including the departure and arrival times of Capt Howard's *Corinthian*, which left Tjilatjap just ahead of *Circe*. However, it was not until I studied these files in detail in late 2013 that I grasped the import of the whole post-war saga of BAIC's attempt to get Commonwealth assistance for its claim against the American government. Reading through the BAIC submission, this too placed great weight on

**A poor-quality but rare photograph of *Circe* at the Qantas flying-boat base at Groote Eylandt in the Gulf of Carpentaria, taken in 1940 during the Horseshoe Route period. Control launch C.A.1 is moored alongside the door, with Shell refuelling vessel Renown beside the flying-boat's starboard bow.**

R. JACKSON VIA QANTAS HERITAGE COLLECTION





PHILIP JARRETT COLLECTION

**ABOVE** Although not by any means a fighter, the Mitsubishi G4M was heavily armed, the G4M1 variant which *Circe* encountered being equipped with 7.7mm (0.303in) machine-guns in the nose, dorsal blister and beam blister positions, as well as a 20mm cannon in the tail turret. *Circe* would have stood little chance against such firepower.

the presence of the Japanese carrier strike force. But then a new piece of information leapt out at me. The insurer's report claimed that there was an excerpt from Japanese records in the US War Department to the effect that on February 28, 1942, a four-engined flying-boat had been shot down by a fighter operating out of Bali. If true, this was important information as the only four-engined flying-boats in the area at the time were the Qantas Empires, and the only one lost in the air anywhere around that time was *Circe*.

Mulling over how this new bit of information might be confirmed, I found an English-language internet discussion forum, [www.j-aircraft.com](http://www.j-aircraft.com), which specialises in Japanese military aviation history. I was aware that the Japanese government had been putting many of its Second World War military records online, but unfortunately I do not read Japanese, and especially the archaic form of Japanese in which these records are written. However, it was evident that there were some among the forum membership who were able to read the Japanese records. Quickly signing up for membership, I posted a request for help to solve the *Circe* mystery. Outlining the story and the competing possibilities of carrier fighters or a fighter from Bali, I suggested that some firm information might be found in the online archives.

#### AN ELECTRIFYING COMMENT

Within 24hr I had replies from two members who were able to provide some important but negative information. Shortly after that a long reply appeared from Osamu "Sam" Tagaya, a noted historian and author on Japanese naval aviation from that period. Sam opened with the electrifying comment, "I had a little time during the year-end holidays, so I took a look through the

relevant *Kodochoshos* [roughly equivalent to RAAF or RAF Operations Record Books] for you, and I believe I have found what you are looking for". Sam began by eliminating a range of possibilities, beginning with the carrier strike force which only flew a limited number of mostly defensive patrol sorties that day. With growing excitement at the detail and quality of the information provided by Sam, I reached the bottom of his reply and, as he put it, the almost literal "smoking gun".

The records revealed that on February 28, 1942, the Imperial Japanese Navy Air Force's *Takao Kokutai* (Takao Air Group), operating from Bali's Denpasar aerodrome, despatched single-aircraft maritime patrols over the Indian Ocean south of Java by four of its land-based Mitsubishi G4M Type 1 bombers (given the Allied reporting name *Betty* from mid-1942). One of these aircraft, commanded by Flight Petty Officer First Class (FPO 1) Sadayoshi Yamamoto and piloted by FPO 1 Noboru Ashizawa, departed Denpasar at 0607hr Java time. Just under 90min later, at 0730hr Java time (1030hr AEST), they sighted a four-engined flying-boat in a position approximately bearing 250° at 230 nautical miles (370km) from base. Just 5min later, at 0735hr Java time, they shot it down into the sea, expending 710 rounds of ammunition in the process.

I was stunned by this detailed information. This was crucial evidence, but on its own it was not yet proof; the next necessary step was to show that the G4M and *Circe* had both been in the same place at the same time. The most likely tracks flown by *Circe* were known: Tjilatjap direct to Broome or via some position up to 75 miles (120km) directly out to sea.

The next step was to plot the position of the combat reported by Yamamoto and Ashizawa.




Even allowing for the navigational inaccuracies of the day, this lay smack within the range of possible tracks flown by *Circe*. The final piece of the puzzle was to look at timings. This was trickier than it sounds as the various archival sources used a range of time-zone references, so everything had to be converted to a uniform reference. After checking and double-checking the archival references and my conversions, I was satisfied that I had produced an accurate timeline of known events. Fortunately *Corinthian's* departure and arrival times were known, enabling calculation of the flying-boat's groundspeed. *Circe's* departure time was also known to within a few minutes so, applying sister-aircraft *Corinthian's* groundspeed to *Circe's* estimated departure time, it was possible to calculate the likely time that *Circe* would have reached the reported combat location.

My blood began to race as I completed the calculation that confirmed what I already strongly suspected; that *Circe* had, by sheer ill fate, almost certainly arrived at the same featureless spot above the Indian Ocean at the same time as the Japanese bomber. *Corinthian*, just a few minutes' flying time ahead, escaped entirely unobserved.

We will never know for certain exactly what happened, but it seems most likely that Yamamoto and Ashizawa, in their faster bomber, must have taken *Circe* by surprise. The flying-boat and its crew and passengers would have stood little chance against the bomber's machine-guns and powerful tail-mounted 20mm cannon. We can only imagine the terror aboard *Circe* as machine-gun bullets and cannon shells tore into it and sent its occupants to an unmarked grave in the lonely expanse of the Indian Ocean some 250 miles (400km) south of Java.

## EPITAPH

It is highly unlikely that *Circe's* slowly dissolving remains will ever be found, or that anybody will even look for them. The courage of civil aviation personnel operating unarmed in the war zone to keep vital lines of communication open is little enough remarked on but, as *Circe's* story shows, the dangers they faced, particularly the Qantas aircrews in late 1941 and into 1942, were every bit as real as those faced by their Service counterparts.

Perhaps the last word in the *Circe* story should be left to Capt Howard's First Officer, John Connolly. He had flown several times with Bill Purton and recalled, "it was a pleasure to number myself among Captain Purton's crew. His never-failing good humour and wit were a big help when the going was difficult. His handling of *Corinna* during the most incredibly violent storm I had ever seen was, in my opinion, a masterpiece of flying". At least the fate of *Circe* and those aboard its last flight is no longer a mystery. 



## CIRCE'S CREW & PASSENGERS

**Captain W.B. "Bill" Purton**  
**First Officer Mervyn Bateman**  
**Radio Officer Herbert Oates**  
**Purser Lionel Hogan**

**Mr Hendrik Fein** (pictured ABOVE) — Consul-General for the Netherlands in Malaya, Knight of the Order of Oranje Nassau

**Mrs Ada Fein-Sansom**  
**Constance Fein** — daughter of the above

**Mr J.M. Viruly** — Consul for the Netherlands in Malaya

**Mrs Viruly**  
**Miss Viruly** — their daughter

**Mr J.H. Cramwinckel** — Vice-Consul for the Netherlands in Malaya

**Mr F.H. van Haelen** — Consulate Chancellor

**Miss Venselaar** — Secretary to the Consul-General

**Miss Maret Tak** — Confidential Secretary to the Consulate

**Commander Joseph A. Murphy** — US Navy, Legion of Merit, Naval Observer at Sandakan, British North Borneo

**Mr Parker** — Sarawak Government representative in the Netherlands East Indies

**Mr Colvin** — BOAC engineer

**Mr Lim Kim Swee** — typist to Malcolm Millar, BOAC

**Messrs Omar and Abdul Samad** — BOAC fitters

*Phil Vabre is Vice-President of Australia's Civil Aviation Historical Society, which operates the Airways Museum at Melbourne's Essendon Airport ([www.airwaysmuseum.com](http://www.airwaysmuseum.com)). He would like to thank Sam Tagaya, Jenny Nevin, Trevor Morley, James Kightly and David Crotty for their invaluable help with the preparation of this feature.*



# Echoes from Dawn Skies

## A Lost Manuscript Rediscovered

**THE STORY SO FAR:** Shortly before his death in 1956, aged 76, renowned pioneer pilot and flying instructor F.W. Merriam — who in 1912 was the first man to fly an aeroplane through cloud — completed a book manuscript, entitled *Echoes From Dawn Skies*. It comprised recollections of the early years of flying, gathered from his contemporaries, many of whom had by then become leading figures in the aviation world.

Seeking “to present a more personal and intimate picture than has yet been produced”, Merriam had asked them each to “contribute a story of a personal nature, something that had never before been published”.

The result was a treasure-trove of fresh, first-hand insights into the lives, the work, the unquenchable spirit and the humour of these early flyers. Sadly Merriam died before the book could be published, and the priceless manuscript vanished into obscurity for more than half a century . . . until, in the summer of 2013, it came to the attention of *The Aviation Historian*. Merriam’s granddaughter, Sylvia Macintosh, aware of the manuscript’s importance and keen to see it finally in print, discovered *TAH* and got in touch with Managing Editor Mick Oakey — who, having picked himself up off the floor after the surprise phonecall, immediately set the wheels in motion. As Mick says, “Reading the material today is the next best thing to teleporting back in time and sharing a pint or a convivial dinner with these remarkable men”.

Merriam introduces his chapter on the Pashley brothers, published for the first time here, with these words:

“To my mind now comes two outstanding members of the Brooklands colony, Cecil and his brother the late Eric Clowes Pashley. Their ‘tickets’ [pilot’s certificates] were Nos 106 and 139 respectively and I keep those numbers united, as these brothers were in those days. I cannot remember which was the elder, but they were both little more than boys with tremendous enthusiasm and guts. I picture them still, in their shirtsleeves, slogging away at their experiments . . .”

**RIGHT** *The Pashley brothers’ specially designed racing biplane, with Eric in the front, beside the restaurant at Shoreham in 1914. Described by Flight as “an extremely neat job”, the aircraft was completed on the Sunday before the Brighton Cup race on Saturday July 11, 1914, with the engine fitted less than 72hr before the race was due to start.*

ALL IMAGES PHILIP JARRETT COLLECTION

In part four of our exclusive serialisation of **FREDERICK WARREN MERRIAM’S** unpublished volume of collected early-aviation memories, *Echoes from Dawn Skies*, Cecil Pashley recalls how he and his brother Eric designed and built a “hot-rod” pusher biplane for the 1914 racing season. Three weeks before the outbreak of the Great War, the pair were ready to take on all comers for the Brighton Cup at Shoreham





# UP FOR THE CUP!

THE PASHLEY BROTHERS: CECIL (1891–1969) & ERIC (1892–1917)

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**S**HORTLY BEFORE THE First World War, my brother and I were considering designing and building a single-seat aircraft for competition flying. The object was to compete in a series of air races to be held at the Shoreham aerodrome during the summer of 1914.

We had been advised to go in for either a monoplane or tractor biplane. The latter type was at the time rapidly becoming popular. One of the most notable examples was the early square-rigged Avro. But we had been doing most of our flying on the Farman-type pusher biplane. We owned two. One was an original. The other was a copy built at Shoreham shortly after our arrival there.

We were keen to continue with the type because we considered it had many advantages

over the tractor, but we were told it would not be capable of a monoplane's speed — or, for that matter, of a tractor biplane's either. We were convinced, however, that we could design and construct a pusher biplane equal in performance and with the same engine — a 50 h.p. rotary.

## A PROCESS OF ELIMINATION

My brother and I had noticed how even the old Bristol Boxkite had been improved by a process of elimination. Unnecessary struts, wires and other impediments had been eliminated until, eventually, there was the Henry Farman machine with a nacelle and no front elevator. It was our idea to carry the process still further.

The early monoplanes were constructed much in the same way as the biplane, with external wire or cable bracing in conjunction





**ABOVE** Cecil (left) and Eric Pashley beside their Henry Farman biplane. Older brother Cecil obtained Royal Aero Club pilot's licence No 106 in July 1911, Eric getting his "ticket" two months later on a Sommer biplane. The pair started a flying school at Shoreham in 1913. Eric was killed in France in March 1917, while serving with the RFC.

with kingposts or cabanes. The main difference with regard to performance came with the span and chord being much less than that of the biplane, resulting in a heavier wing loading and consequent increase of speed. As our machine was to be a biplane, we started by decreasing the span to rather less than that of the average monoplane of the time. A corresponding decrease was made in the chord and gap. That cut to a considerable extent the length of interplane struts and wire bracing and so brought the wing loading to about that of the monoplane — three times that of the old pusher. By modern standards it might seem a crude method of attacking the problem, but it was simple and it worked.

All struts and fittings were carefully streamlined. The inter-tailboom struts were offset so as to be streamlined with the airflow. The old single-surfaced wings were replaced with an efficient wing section. The next thing was to substitute a non-lifting tail for the cumbersome and heavy lifting variety common to all the old pushers. In the standard Boxkite the engine and propeller were fitted, thus making a heavy and cumbersome lifting tail necessary. To overcome this difficulty we cut away and faired off the trailing edge of the upper and lower centre sections to accommodate the propeller, raised the engine and fitted it just between, instead of behind, the mainplanes. The arrangement brought the weight well forward

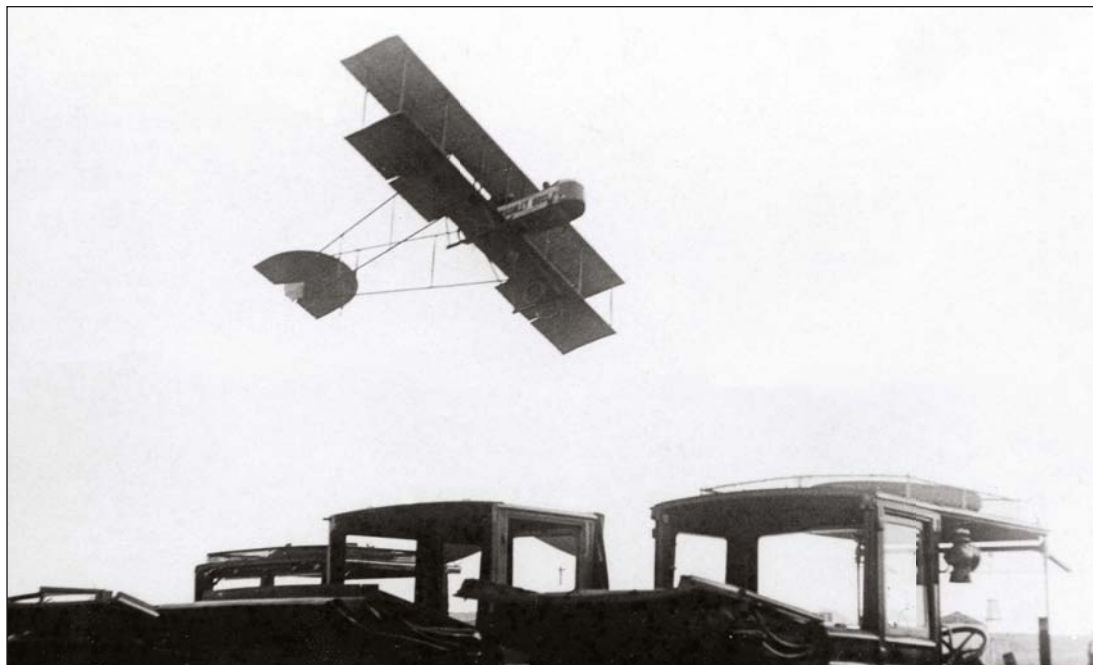
and, at the same time, I believe that our machine was the first pusher biplane to be fitted with a non-lifting tail.

### RACING THE CLOCK

Certain people were sceptical and maintained she would not be a success. One or two of them, in fact, said that the longitudinal stability would be bad because of the lack of covered-in fuselage coupled with the non-lifting tail. That would have been serious had it been true because the machine was more than half-finished by that time. We had also entered it for the Brighton Cup to be flown at Shoreham on July 11 [1914],







**ABOVE** *The Pashleys' racing biplane, with its non-lifting tail and distinctive cut-outs on the trailing edges of the upper and lower wing centre sections, was fitted with a 50 h.p. Gnome rotary engine which enabled the carriage of two passengers. Ailerons were fitted to the upper and lower wings, which were of short span and narrow gap.*

and there would have been no time to make any extensive alteration. I must say that I wavered at this juncture and felt there might be something in what people were saying. My brother Eric, who was always much more technical than I in his approach to such a problem, was positive, however, that the machine would be perfectly stable longitudinally. He also calculated the machine would equal in speed at least the 50 h.p. Gnome Blériot monoplane. As usual, he turned out to be correct.

On the day the machine was tested, the day before the race, incidentally, she proved perfectly stable both longitudinally and laterally. Also her

average speed over a measured course flown in both directions was 61 m.p.h. [98km/h], approximately that of the 50 h.p. Gnome Blériot, and, if anything, a little better. We later started work on an improved version to be fitted with a 100 h.p. engine, but we were prevented from completing it because of the war.

I remember so well the interest taken in our machine after its tests by some of the competitors, among them our old friend Jack Alcock. Laurence Hall, who had entered one of the increasingly popular 50 h.p. Gnome Avro biplanes, was another who showed great interest. There was also that famous pioneer

**The Pashleys' Henry Farman biplane at Shoreham in 1914, with a Green-engined Avro Type D in the background. The race for the Brighton Cup on July 11 that year included two heats of four laps each and a final of six laps of the 1¼-mile (2.8km) course, the winner receiving not only the cup but also £70, courtesy of Shell.**





**ABOVE** Originally from Sheffield (where he reportedly flew two chimpanzees over Redmires racecourse in his Blériot in November 1912), John Laurence Hall gained aviator's certificate No 291 on September 17, 1912. Here he poses beside the Avro 500 in which he participated against the Pashleys in the race for the 1914 Brighton Cup.

Gordon Bell who urged us to practise as much as possible for the rest of the day. "Go out again and fly as much as possible", he said. "She is quite fast and might easily win tomorrow".

## THE RACE BEGINS

It was a closed-circuit pylon race run off in heats because the circuit was small. The actual distance of the course escapes my memory but the competition was in full view of the spectators all the time.

We had decided that my brother should fly the new machine in the race, so I entered one of our Farmans to fly myself. We both managed

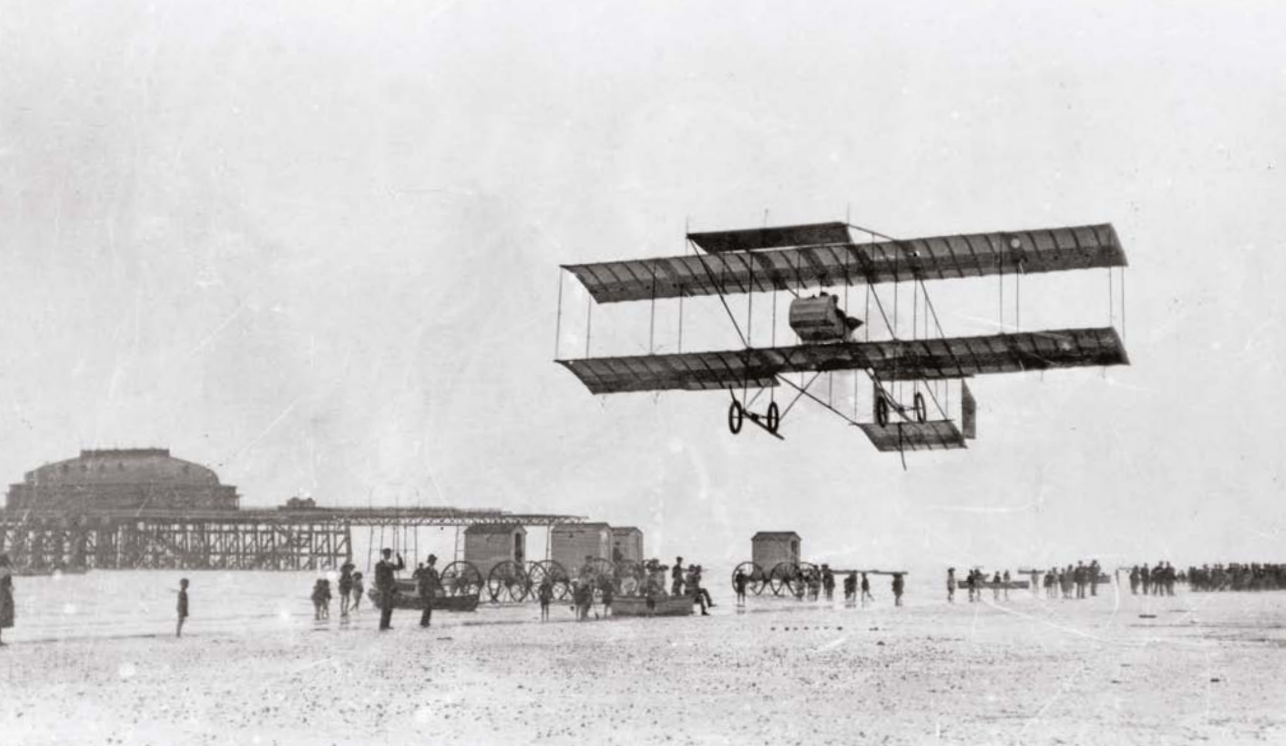
to qualify for the final, the two other finalists being Alcock, flying a 120 h.p. Sunbeam Maurice Farman, and Hall with a 50 h.p. Gnome Avro. By modern standards that might not seem a very attractive bag, but was quite good for those days and managed to produce quite an exciting race.

Alcock's Maurice Farman was thought to be the fastest machine by the handicappers. As a result he could not possibly have won. He expressed his dissatisfaction in no mean terms. Hall, I think, was under the impression that he was going to win easily. He was not worried a bit about the few seconds start my brother had

**With Hall's Avro 500 in the foreground, aircraft line up for the start of the second heat of the Brighton Cup on July 11. Beyond the Avro is the Pashley racer, Eric Pashley being given a 1min start ahead of Hall, and at the far end is G.J. Lusted's Henry Farman (2¼min head start). Pashley won the heat easily, beating Hall by more than a minute.**







**ABOVE** The Pashleys' Henry Farman biplane flying from Worthing beach. In July 1914 Cecil participated in an aeroplane vs automobile race from Shoreham to Worthing and back in the aircraft. Initially hampered by a strong headwind westbound, Pashley used the tailwind on the return leg to romp home in 14min, 4min ahead of the car.

over him. But he was mistaken. In spite of his perfect flying he was quite unable to make any impression on the small lead my brother had.

Afterwards he lodged a complaint stating that my brother had cut inside one of the pylons and so managed to keep ahead. My brother flatly denied it and offered to fly the course again with Hall. The result was a most exciting battle between the two pilots, much to the delight of the crowd — and with exactly the same result.

I was unable to complete the course because the main bronze ring burnt up in one of my cylinders and the engine seized.



**MERRIAM CONCLUDED** his chapter on the Pashleys with the following epilogue:

“As an instructor, I have sentiments and a strong fellow feeling for Cecil Pashley. In fact, we’ve had a very close contact, too, at Brooklands, when we collided one misty morning there. I was landing with a pupil and Pashley was taking off. The impact was pretty bad. Our machines were badly damaged but thankfully nobody was hurt.”

■ More exclusive extracts from *Echoes From Dawn Skies* coming soon . . .







# AMERICA'S *ramjägers*

The US Army Air Corps and  
the 1940-41 "ramfighter" project



The story of the Luftwaffe's desperate attempts to turn back the tide of the war by using fighter aircraft to ram enemy bombers in 1945 is comparatively well-known. What is not widely realised, however, is that the United States Army Air Corps had investigated the idea back in 1940–41. **ALAN GRIFFITH** uses previously unpublished documents to explore the USAAC's proposals to turn specially armoured P-39s and P-40s into "ramfighters"

**M**OST STUDENTS OF the Allies' bomber offensive against Germany during the Second World War are familiar with the Luftwaffe's desperate plan to halt, or at the very least slow, Allied bomber missions by having fighters fly directly into the bombers, with the pilots baling out shortly before or just after ramming the bomber. The story of *Sonderkommando Elbe's* one and only mission, on April 7, 1945, and plans for other missions by the Luftwaffe's "*Ramjäger*s" have been told elsewhere. What is much less well-known, however, is the fact that — five years earlier — the United States Army Air Corps (USAAC) had already investigated the concept of fighters ramming enemy bombers.

### Setting the scene

On October 31, 1940, a conference held by the US Secretary of War, Henry L. Stimson, resulted in a verbal directive being issued the following day by General Carl "Tooey" Spaatz, then Chief of the Plans Division. The directive called for a study to be undertaken on increasing armour protection on existing pursuit aircraft (the USA's contemporary term for fighter aircraft), and those currently under development, so the aircraft could ram-attack hostile bombardment aircraft.

The purpose of this study, Serial No CTI-141, was to armour

**TOP LEFT, OPPOSITE** One of two types explored as "ramfighters" by the US Army Air Corps during 1940–41, the Curtiss P-40 was an inline-engined development of the P-36 radial-engined fighter of 1935.

**BELOW** The other prospective ramfighter was Bell's unusual P-39, with its mid-fuselage-mounted Allison V-1710 engine and tricycle undercarriage. Here P-39Ds of the 31st Pursuit Group await their next mission at Selfridge Field, Michigan, in 1941.

PHILIP JARRETT COLLECTION x 2





**ABOVE** A P-39C of the 31st Pursuit Group. The C variant differed from all other versions of the Airacobra, as the aircraft was called, in having its 37mm T-9 cannon and two 0.50in and two 0.30in machine-guns all installed in the nose, with no wing-mounted weapons. The variant was not considered combat-ready on its introduction and only 20 saw service with the USAAC.

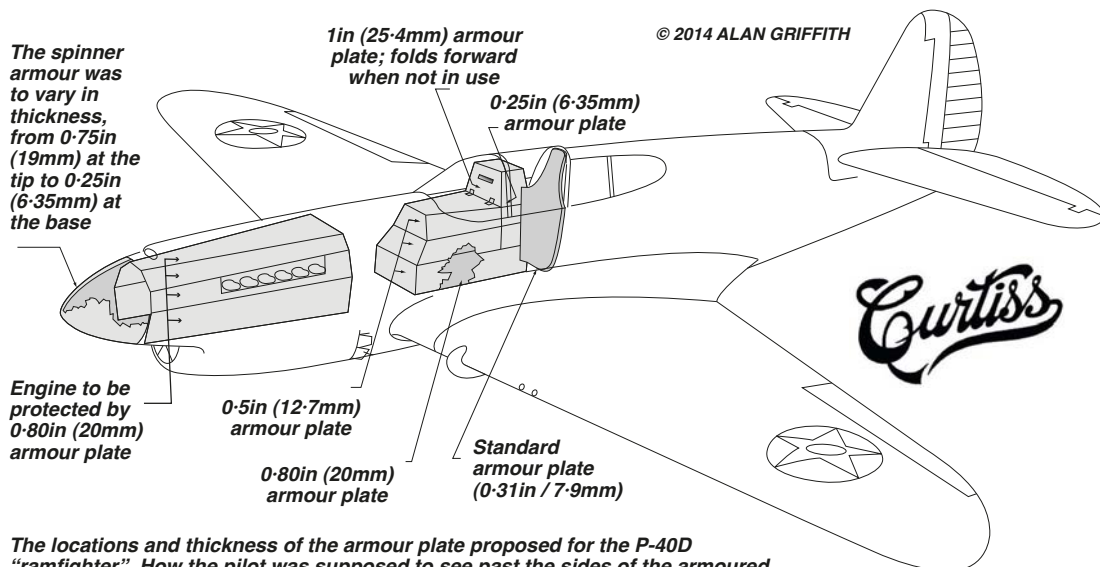


**LEFT** Born Carl Andrew Spatz, the future American general added an extra "a" to his surname in 1937 to encourage his preferred pronunciation, which resembled "sparts" rather than "spats". Spatz scored three aerial victories in World War One and in 1940 spent time in England as a special military observer during the Battle of Britain.

**BELOW** The P-40D variant introduced a number of modifications to the type, including a shorter fuselage and undercarriage, a deeper nose radiator cowl and the removal of the fuselage guns. The calibre of the wing-mounted machine-guns was also increased from 0.30in to 0.50in. Only 22 were delivered to the US Army Air Forces, the remaining 560 produced going to the RAF to serve as Kittyhawk Mk Is. PHILIP JARRETT COLLECTION







The locations and thickness of the armour plate proposed for the P-40D “ramfighter”. How the pilot was supposed to see past the sides of the armoured “head-box” during combat manoeuvres, or bale out, were not addressed by the study.

## Change in weight and balance for Curtiss P-40D

Condition	Original	Revised (with armour)
Normal loaded weight	7,685lb (3,485kg)	8,554lb (3,880kg)
Balance		
Wheels up	32.1% m.a.c.*	26.7% m.a.c.
Wheels down	30.2% m.a.c.	—
Most nose-heavy <sup>†</sup>	6,469lb (2,935kg)	7,338lb (3,328kg)
Balance (wheels down)	22.3% m.a.c.	19.6% m.a.c.
Most tail-heavy <sup>‡</sup>	7,886lb (3,577kg)	8,775lb (3,980kg)
Balance (wheels up)	33.3% m.a.c.	29.4% m.a.c.

\* mean aerodynamic chord <sup>†</sup>Most nose-heavy condition — wheels down, less fuel, ammunition and oxygen

<sup>‡</sup> Most tail-heavy condition — wheels up, maximum ammunition and full fuel tanks

pursuit aircraft so that the pilot, “in cases of extreme emergency . . . even in the case of superior hostile defensive firepower”, could ram and thus destroy the hostile aircraft. The tactic to be used was a quartering approach with the intent of hitting the enemy aircraft’s empennage. It was not, however, intended to be a suicidal plunge into the enemy. The Technical Instructions issued by the Air Corps’ Materiel Division, dated November 26, 1940, stated:

“As stressed during the conference in the Office [of the] Secretary of War, the morale factor in such tactics would quite naturally depend on the likelihood of the pilot of the ramming aircraft standing a reasonable chance of being able to abandon his machine just prior to the moment of collision, or on the strength factors of the cockpit section of the ramming aircraft being such that it would stand up under the collision impact, assuring the pilot of a possible chance of escaping after the collision.”

The document also stated that “since the collision tactics are to be employed as a last

resort, the offensive firepower of the collision aircraft must be held as high as possible, consistent with the weight limitations imposed by the additional armour protection”. Since the intent was to study existing pursuit aircraft in the inventory or those in the late development stage, the Bell P-39C, Curtiss P-40D and Republic P-47 were specifically mentioned.

The importance of the study may be best measured by the directive that the results be submitted within 60 days, with February 16, 1941, given as the date when results were to be in hand. On January 22, 1941, a teletype from the Chief of the Experimental Engineering Section confirmed that every effort would be made to forward the study before February 16.

### Adding armour

On February 6, 1941, official report Serial No EXP-M-51/P744, was submitted, along with numerous drawings. Unfortunately, many of the drawings have yet to be found and may be lost forever, but what remains provides some



**ABOVE** Had the “ramfighter” concept been adopted by the USAAC, later variants, like the P-39D seen here, would have been modified accordingly. The non-turbo-supercharged Airacobra’s performance at high altitude was poor, however, and the added weight of the armour would have further compromised its ability to reach enemy bombers.

fascinating prospects and forms the basis of the illustrations presented here.

The armour plate in both the P-39C and the P-40D was to be installed to give optimum protection at firing angles of 30° to the flightpath. The proposed revisions to both types considered only the additional armour plate, with no attempt made to estimate the additional weight required by any structural changes needed to accommodate the weight of the armour plate.

The report stated that “no study of the P-47 as a ramming aircraft was made. This aircraft is powered by an air-cooled engine, entirely impractical to armour and cool”.

In theory, the addition of the armour to the P-40D raised the weight of the aircraft by nearly 870lb (395kg), resulting in the report’s recommendation to increase the size of the aircraft’s smooth-contour tyres from 30in (76cm) to 33in (84cm). This, however, would have necessitated a major redesign of the wing structure in order to enlarge the wheel wells.

The prospective armour for the P-39C was divided into two categories as follows:

■ **Revision No 1:** it was proposed that the aircraft be stripped of its original armour, 37mm cannon and two 0.30in machine-guns and ammunition, which weighed a cumulative total of 541lb (245kg), and fitted with the proposed ramfighter armour, which weighed 740lb (335kg); the total added weight to the original loaded weight would be 199lb (90kg);

■ **Revision No 2:** as above but with the retention of two 0.5in machine-guns and ammunition (267lb/121kg), making a total added weight of 466lb (211kg) to the original loaded weight.

The proposed addition of some 740lb of armour plate to the P-39 would have had a

similarly deleterious impact on the type’s tyres as on those of the P-40D. The load on the 26in x 6in (66cm x 15.25cm) high-pressure tyres and undercarriage would have leapt from 219lb (99kg) per wheel to a crushing 452lb (205kg) per wheel. No mention is made of the need for larger tyres or any changes in the wheel wells with the P-39, however.

With the concentration of weight in the nose that the increased armour would bring, the c.g. of the P-39 would be compromised, necessitating the removal of the 37mm cannon and two 0.30in machine-guns, although Revision No 2 was put in place to offer at least some form of firepower for the P-39.

### The report’s conclusions

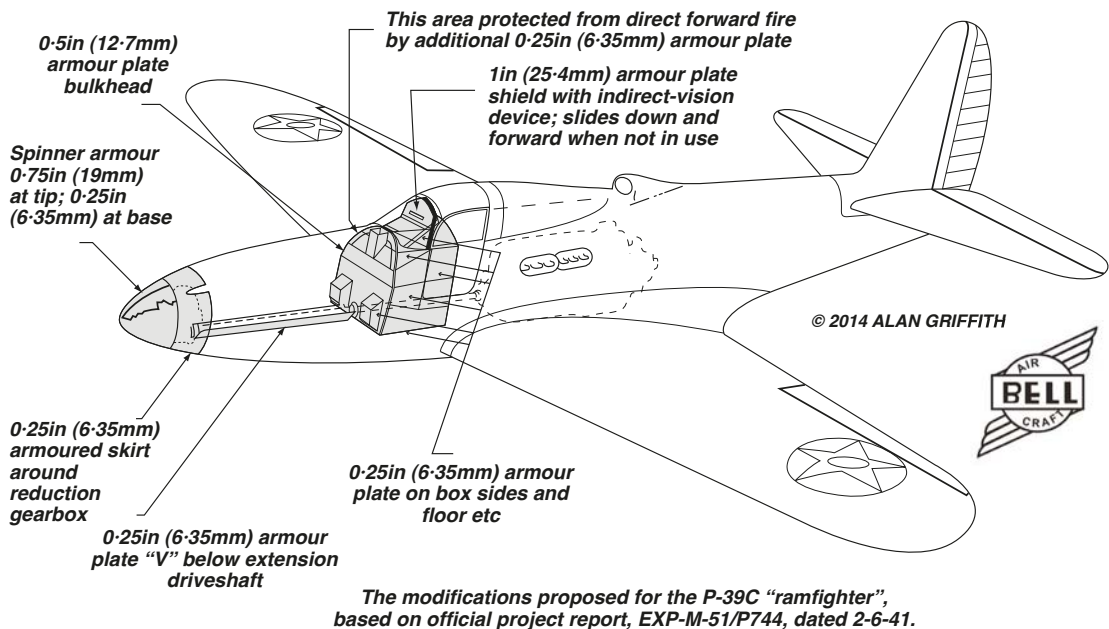
The complete official final report on the prospective ramfighters has yet to be found in the archives, but the conclusions are discussed in a letter dated December 31, 1941, to Major Edgar J. Tobin, regarding “Intercepting Bombers”. The points made are directly quoted as follows:

■ “It is impractical to modify any existing type of pursuit aircraft into a ‘collision’ type and to retain reasonable firepower and high speed;

■ “A ‘ramming’ or ‘collision’ type aircraft can be built embodying reasonable protection against aircraft gunfire. However, such an aircraft would be 50–60 m.p.h. [80–97km/h] slower than an equivalent aircraft not so designed.

■ “Since it does not appear reasonable to predicate development of material upon the normal employment of suicide tactics, some means of escape must be provided for the pilot prior to collision; no assurance can be given that a means of exit after collision can be provided.

■ “No means of exit just prior to collision can be



## Change in weight and balance for Bell P-39C

Condition	Original	Revision No 1	Revision No 2
Normal loaded weight	6,689lb (3,034kg)	6,888lb (3,124kg)	7,155lb (3,245kg)
Balance			
Wheels up	24.1% m.a.c.*	23.51% m.a.c.	23.54% m.a.c.
Wheels down	23.3% m.a.c.	22.73% m.a.c.	23.73% m.a.c.
Most tail-heavy†	6,925lb (3,141kg)	7,123lb (3,231kg)	7,390lb (3,352kg)
Balance (wheels up)	27.3% m.a.c.	26.5% m.a.c.	26.46% m.a.c.

\* mean aerodynamic chord † Most tail-heavy condition — guns in place, fitted with radio transmitter, no ammunition, overload fuel less one-third

guaranteed that will positively eject the pilot at the necessary instant on account of the following time and distance factors involved:

(a) speed differential between 'ramming' and hostile aircraft will probably not be less than 50 m.p.h. [80km/h], equivalent to 73ft [22m]/sec;

(b) the probable maximum flight distance during which a 'ramming' aircraft could be pilotless is 50ft [15m];

(c) the maximum operating time for pilot ejection would therefore be  $\frac{2}{3}$  of one second.

■ "This Division concurs in the belief expressed above that 'while under emergencies, ramming contacts might be indicated, it is far better to develop into our pursuit aircraft such heavy firepower that this alone will do the job'."

Tobin, who disagreed, had already sent a number of letters about the subject of ramfighters to his friend, "Tooey" Spaatz. One of them, dated December 12, 1941, stated:

"Again I submit to you the proposition that the safest and only sure way to intercept a bomber is to make contact with it. Had we and the

British been so equipped, the disasters at Pearl Harbor and Singapore [the latter referring to the Japanese bombing raid on December 8] might never have happened. Listen to me, please!"

A copy of this letter was also sent to the US Secretary of Commerce, Jesse H. Jones. On December 27, 1941, Jones forwarded the letter to Gen Henry "Hap" Arnold, simply stating: "Here is our friend Tobin with his combat 'plane idea'". Arnold scrawled a note to Spaatz across the bottom of the letter; "Spaatz, prepare reply for my sig[nature]. HHA".

Meanwhile, Tobin's letter made its way through the bureaucracy at Headquarters Army Air Forces, most of the resulting comments suggesting that the ramfighter study was completely unknown at HQ. On December 22, 1941, the Assistant Chief of Staff for the Air War Plans Division, Lt-Col Harold L. George, made something of an understatement when he commented that "the disasters referred to [Pearl Harbor and Singapore] are not believed to be due to the reasons Major Tobin suggests".





**ABOVE** Although often considered as something of an “also-ran”, the P-40 was built in ten main production variants, including the Packard Merlin-powered P-40F as seen here. By the time production ceased in 1944 a total of 13,738 had been built, the third highest American wartime fighter production run after the P-51 and P-47.

Two days later a document signed by “C.E.D.” made the following clarifying comments:

“In a report [issued at] the time of the entry of the Russians into the war, there was a statement that the Russians were flying into enemy aircraft with the idea of putting them out of control. The statement indicated that Russian aircraft had been strengthened in certain places to permit this without undue damage to the Russian aircraft.”

The report continues: “General Spaatz believes Tobin’s thought is along the same lines and thinks that we might look further into this.” This last statement is curious, as Spaatz had been involved in the decision to conduct the ramfighter study back in November 1940. It seems that “C.E.D.” was unaware of this.

The final link in this chain of documents is

from the Office of the Chief of the Air Corps, dated December 31, 1941, and signed by Gen Walter R. Weaver, Acting Chief, Air Corps, later Commanding General of the Army Air Forces Technical Training Command (AAFTTC). His comments consisted of a reiteration of the findings of the original study.

### A dead-end concept

Ultimately, the USAAC wisely rejected the entire concept of the ramfighter based on existing types already in service. In examining the drawings of the armoured aircraft, the author is left with one overarching question: assuming the drawings correctly show the pilot’s armoured “case” in relationship to the rest of the cockpit, how was a pilot in full flight gear — including his parachute

## P-40D and P-39C “ramfighter” performance data

THE DATA BELOW is entirely speculative, no actual aircraft modifications ever taking place as part of the USAAC’s 1941 “ramfighter” concept; it was only ever a “paper project” based on aerodynamic studies.

	P-40D		P-39C		
	Original	Revised	Original	Revision No 1	Revision No 2
Maximum speed	384 m.p.h. (618km/h)	338 m.p.h. (544km/h)	377 m.p.h. (607km/h)	373 m.p.h. (600km/h)	370 m.p.h. (595km/h)
Landing speed	80 m.p.h. (129km/h)	91.5 m.p.h. (147km/h)	80 m.p.h. (129km/h)	82 m.p.h. (132km/h)	84 m.p.h. (135km/h)
Max rate of climb	2,950ft/min (899m/min)	2,290ft/min (698m/min)	3,200ft/min (975m/min)	3,100ft/min (945m/min)	2,900ft/min (884m/min)
Increase in take-off distance		320ft (97.5m)		115ft (35m)	284ft (87m)
Increase in landing distance		100ft (30.5m)		—	—



**LEFT** *The Commanding Officer of No 601 (County of London) Sqn of the RAF, Sqn Ldr E.J. Gracie, demonstrates the “car-door” of the P-39 during the unit’s tenure with the type from August 1941 until March 1942.* PHILIP JARRETT COLLECTION

**BOTTOM** *Had the Lockheed P-38 Lightning been combat-ready when the ramfighter project was discussed during 1940–41, it may have also been included in the proposals. The P-47 was deemed impractical for the ramfighter role, but in truth the entire concept was unworkable.* TAH ARCHIVE

— supposed to get out of the aircraft at all, much less bale out just before hitting the enemy aircraft? Indeed, one wonders how the pilot was even supposed to get *into* the aircraft given the tight fit in the cockpit once the armoured box, seat and various other items of equipment had been fitted. Nothing in the currently available documents addresses this issue.

Other factors that were apparently not addressed regarding the P-39 (although they were probably not yet widely known) was the aircraft’s nasty tendency to tumble end over end, and the fact that the type’s “car-door” was extremely difficult to open against the slipstream to bale out even at the best of times.

Another curious anomaly was that the two aircraft types involved — the P-39 and the P-40

— were notorious throughout their production runs for having little or no performance above 13,000ft (4,000m) owing to their lack of turbo-supercharging. Combat altitude would have undoubtedly been further compromised by the additional weight of the armour. While it would be very nice of the enemy to promise to come in at 10,000ft and at least give the pursuits a “fighting chance”, that would not have happened more than once.

Bearing these points in mind, one may well ask why the Lockheed P-38 was not considered. The first YP-38 had flown on September 17, 1940, a mere two months before the Secretary of War’s conference, but the USAAC would not have a full complement of 13 test examples until June 1941, and a substantial amount of testing and redesign for suitability for mass production still remained to be done. It wasn’t until 1942, when the P-38F was delivered, that the Lightning was considered to be truly combat-ready.

At the time of the ramfighter trials, the P-39 and P-40 were at the crossroads where the strategy, tactics and technology of the past met those of World War Two and beyond. The whole notion of the “pursuit aircraft”, a point-defence interceptor designed to climb rapidly to altitude and intercept enemy bombers as they neared their target, was already out-of-date, as the US Eighth Air Force would soon find out.

But that, as they say, is another story.



# PARTY TIME!

OPERATION CREEK PARTY: THE **BOEING KC-97L** IN EUROPE





With the USAF's Boeing KC-135 Stratotankers committed to operations in South-east Asia in the mid-1960s, it fell to the venerable piston-engined Boeing KC-97 and the Air National Guard to fulfil Tactical Air Command's air-refuelling requirements in Europe. **BOB ARCHER** takes a look at Operation *Creek Party*

*Boeing KC-97L serial 53-0363 was one of 81 examples of the piston- and jet-powered variants to be used by the Air National Guard (ANG). It is seen here in July 1973 while serving with the Texas ANG, hence the Lone Star symbol on the type's distinctive rounded nose.*

DAVE DAVENPORT VIA AUTHOR

**F**OR NEARLY A decade during the Cold War, the busy air-refuelling corridors above central Germany reverberated to the distinctive rhythm of groups of four Pratt & Whitney R-4360-59 Wasp radial engines. The aircraft flying these important training missions were Boeing KC-97L Stratofreighters, which had been given a new lease of life owing to the USAF's insatiable requirement for additional Boeing KC-135 tankers to support the war effort in South-east Asia. These Stratofreighters, which earlier in their careers had been designated as KC-97Gs (and affectionately abbreviated simply to "Strats"), had once been the backbone of the aerial refuelling task for Strategic Air Command (SAC), until the last examples were withdrawn from active-duty squadrons at the end of 1965.

### JOINING THE GUARD

The dependable Strat had entered Air National Guard (ANG) service in May 1961 in the aerial refuelling role, with Illinois and Wisconsin being the first two ANGs to re-equip with the type. Initially, KC-97Fs were used by the ANG units, although their careers were short-lived, as surplus KC-97G models became available in appreciable numbers, enabling the latter variant to begin reserve service from late 1962.

To begin with, Air National Guard KC-97s were predominantly flown on operations within the USA, thereby releasing additional KC-135 Stratotankers to deploy to South-east Asia. The KC-97 was barely adequate to perform the refuelling task, however, as its Wasp engines struggled to maintain formation with new jet bombers like Boeing's B-47 and B-52. Furthermore, the Strat struggled with refuelling the "Century Series" of jet fighters and the newer McDonnell Douglas F-4 Phantom II, the tanker often having to transfer fuel while in a shallow descent. Under normal refuelling conditions the venerable Strat would be close to its maximum cruising speed, while the F-4 was on the verge of a stall, the diving refuelling mode offering an additional safety margin, although it was clearly far from ideal.

The possibility of ANG KC-97 tankers being stationed permanently in Europe followed the successful deployment of 28 Strats to Europe in August 1964 under Operation *Ready Go*, during which they refuelled 19 North American F-100s and 12 Republic RF-84F Thunderflashes on their transatlantic deployment. It was the ANG's first major intercontinental operation and reinforced the shortcomings of the KC-97. Apart from the tanker's difficulty with maintaining an acceptable altitude, there was also the ever-present possibility of a fully loaded KC-97 losing an engine while departing a local airport on a hot and humid day, with potentially catastrophic results. Such an engine failure would require the underwing tanks to



**ABOVE** The first KC-97 to be fitted with General Electric J47 turbojets on hardpoints on the outer wings, where long-range fuel tanks were originally positioned, was 52-2697 of the Illinois Air Guard in the spring of 1964. It is seen here at Volk Field, Wisconsin, in July 1970. The Illinois ANG operated the KC-97L until the end of 1976.

be jettisoned — unthinkable given the proximity of municipal airports to densely-populated areas.

The solution was devised by personnel of the Illinois ANG's 108th Air Refuelling Squadron, based at Chicago's O'Hare Airport. A team headed by aeronautical engineer Lt Philip A. Meyer investigated the possibility of using surplus General Electric J47 jet engines taken from retired Boeing KB-50J/K Superfortresses, and installing them on the hardpoints formerly used to mount the KC-97's underwing tanks.

Each J47 would offer an additional 5,970lb (2,710kg) of thrust, representing a considerable boost in performance during take-off and climb to altitude. Furthermore, the addition of the jet engines would increase the tanker's ceiling from 15,000–20,000ft (4,500–6,000m) to 30,000ft [9,000m], as well as provide a 30kt speed boost during refuelling missions, thereby improving compatibility with receivers. An AN/APX-29 long-range "rendezvous" radar was also installed atop the fuselage in a large fairing.

#### FOUR TURNING, TWO BURNING

Following a feasibility study, the concept was evaluated by Air Force Systems Command (AFSC), which arranged for a contract with the Hayes Aircraft Corporation, based at Birmingham Municipal Airport in Alabama. Hayes had considerable experience with the maintenance and repair of multi-engined types and had performed a similar upgrade to the USAF's KB-50s. Stored examples of the latter were stripped of the components necessary to upgrade the ANG's KC-97s, which was a fairly simple process.

The biggest stumbling block to the programme was funding, a situation resolved by the head

of Tactical Air Command (TAC), Gen Walter C. Sweeney Jr, who supported the ANG's proposal owing to the inability of Strategic Air Command (SAC) to fulfil TAC's wartime air-refuelling requirements. The ANG tanker force was subordinate to TAC in the event of mobilisation, and was therefore of considerable interest to Gen Sweeney. The prototype KC-97 jet modification cost \$67,000 to complete, reduced to \$36,000 per aircraft for the remaining 55 KC-97L conversions.

The first KC-97G to be upgraded to KC-97L standard was 52-2697 of the Illinois ANG, which commenced an evaluation of the new variant on May 29, 1964. The trials involved the acquisition of receivers using the AN/APX-29 system, as well as identifying parameters for the refuelling envelope for each type of receiver. The prototype is reported to have been allocated the designation JKC-97L, with the additional "J" prefix applied to indicate temporary test. However, USAF records do not show this designation, so it was presumably unofficial.

The evaluation was apparently quite straightforward, as, before it was completed, KC-97G 53-0150 of the 151st ARS, Tennessee ANG, began undergoing modification on August 7, 1964, and was completed on October 2 the same year. A second 151st ARS aircraft, 53-0315, began conversion in late September 1964, but was not completed until March 3, 1965. Conversion time varied, as some aircraft required additional maintenance to rectify faults that became apparent only when technicians started work.

Initially, five units received the KC-97L, all having been previously equipped with G models, which were gradually recycled through the modification programme.



*Wisconsin ANG KC-97L 52-2698 provides a top-up for 78th Tactical Fighter Squadron McDonnell Douglas F-4D 65-0767 over Germany in September 1969. The problem of compatibility between the piston-era KC-97 and the jet-age Phantom was amply resolved with the addition of the turbojets to the tanker. The "O" prefix on the KC-97L's fin serial was given to all USAF operational aircraft that were more than ten years old.*

BOB ARCHER COLLECTION

Following Operation *Ready Go*, the ANG began sending individual KC-97Ls to Europe for short periods, with sorties flown from Rhein-Main Air Base near Frankfurt in West Germany, beginning in June 1965, although visits were sporadic. The crews of the KC-97Ls proved to be adept at conducting aerial refuelling activities effectively despite the adverse weather conditions, which were often rather different from those experienced at home. The airspace above Europe was also far more congested than that within the USA.

France's withdrawal from Nato in 1966 created a huge problem for the United States Air Forces in Europe (USAFE), as the latter's fighters transiting between northern Europe and Mediterranean countries could no longer refuel in France. As a result, the fighters were fitted with droptanks to enable them to reach Aviano Air Base in northern Italy. However, Aviano could not handle the large increase in traffic, and exercises in Greece, Italy and Turkey had to be cancelled.

## GETTING THE PARTY STARTED

The USAF's Chief of Staff, Gen John P. McConnell, directed that the ANG KC-97Ls be rotated to Europe. A European evaluation of the variant's compatibility with the F-4 was conducted in February 1967 with a KC-97L from the 126th Air Refuelling Wing (ARW) of the Illinois ANG, and another from the 136th ARW of the Texas ANG was used to validate the concept. Refuelling missions were conducted at 26,000–29,000ft (8,500–9,500m) and at airspeeds between 210 and 220kt. Initially, members of USAFE personnel were sceptical, as previous KC-97/F-4 tests had been inconclusive, but the tests in Europe quickly proved to be entirely successful.

## THE ANG'S FIRST FIVE KC-97 UNITS

The five units were (the first month/year being that when the first of each variant was taken on charge):

### 108th ARS, Illinois ANG

KC-97F — August 1962 to March 1963  
KC-97G — September 1962  
KC-97L — May 1964 to December 1976

### 126th ARS, Wisconsin ANG

KC-97F — May 1962 to March 1963  
KC-97G — September 1962  
KC-97L — March 1965 to January 1978

### 151st ARS, Tennessee ANG

KC-97G — April 1964  
KC-97L — January 1965 to September 1976

### 181st ARS, Texas ANG

KC-97G — May 1964  
KC-97L — March 1965 to June 1978

### 145th ARS, Ohio ANG

KC-97F — March 1962 to March 1963  
KC-97G — November 1962  
KC-97L — March 1965 to August 1975

**NB** There was a period when squadrons were equipped with both the KC-97G and L models, as aircraft were cycled through the upgrade process

Operation *Creek Party*, as the project was known, began as an ongoing four- to five-aircraft rotation to Rhein-Main on May 1, 1967. Aircraft were to be flown from their home base to Rhein-Main over a weekend, with each squadron commencing operational sorties the following Monday. On completion of their rotation, these aircraft would then return to their home station, with the next squadron arriving in readiness to assume the duty. The 181st ARS at Naval Air Station Dallas,





**With its refuelling boom fully extended, KC-97L 52-0905 of the Wisconsin ANG performs a flyby as part of a memorable display at Greenham Common in July 1973. This aircraft has been preserved and is currently on display as a "gate guardian" at the Wisconsin ANG's base at Volk Field.**

TAH ARCHIVE

Texas (now the Grand Prairie Armed Forces Reserve Complex), inaugurated the operation with five KC-97Ls on May 1, 1967. The first mission was flown by Col Nowell D. Didear, Commander of the 136th ARW of the Texas ANG, on a 4hr mission to refuel F-100 Super Sabres above Baumholder, 85 miles (140km) south-west of Rhein-Main.

*Creek Party* sorties were normally performed on weekdays, with missions being primarily routine training, none involving intercontinental fighter or bomber deployments. Three sorties per day were planned, with a backup aircraft available as a replacement if necessary. It was initially anticipated that *Creek Party* would last for just one year, but in the event it was expanded to a second year, and continued thereafter with progressive year-on-year extensions as the war in Vietnam dragged on.

The operation was manned on a volunteer basis, with a plan for each unit to provide about 90 personnel and between five and eight aircraft

per month. As some 75 per cent of ANG personnel were traditional part-time members, their stay in Germany could only be 15 days, the length of their annual mandatory active-duty training period. They were then replaced by another group from the same unit, with the aircraft remaining at Rhein-Main. Participating aircraft were scheduled to be at the base for 38 days, enabling a smooth transition from one unit to another. During the second year, the operational tempo was switched to a 15-day rotation as a result of manning problems for 38-day deployments.

Such was the effectiveness of *Creek Party* that the number of aircraft available on any given day was often five and occasionally six. The KC-97Ls were in Europe to augment the fleet of KC-135s, which continued to deploy but in reduced numbers. *Creek Party* missions were planned to provide aerial refuelling training for USAFE tactical fighter squadrons. Receivers initially included the F-100 Super Sabre, McDonnell RF-101 Voodoo, Convair F-102 Delta

**Wearing the distinctive triangular nose emblem of its former unit, the 11th ARS, 53-0276 is seen here at Davis-Monthan AFB, Arizona, in November 1969. Within a few weeks it had been removed from storage to become one of the second batch of 26 KC-97Gs to be converted to L standard. Note the original wing tanks.**

JEFF PECK VIA AUTHOR





**LEFT** *The view from the glasshouse — visibility from the KC-97's extensively glazed flightdeck was exceptional. The "office" of the tanker was spacious and well laid-out and proved to be popular with its crews. Here an Ohio ANG KC-97L pilot searches for his next contacts during a refuelling mission from Rhein-Main in June 1969.*

Dagger and Republic F-105 Thunderchief. All of these "Century Series" types were in the process of being relieved from USAFE service at the time, with most being replaced by the Phantom during the late 1960s and early 1970s.

## OUT OF STORAGE

To sustain *Creek Party* effectively, the five existing squadrons were required to participate every ten weeks, which created a considerable strain on personnel. To alleviate this problem, the ANG elected to convert five more squadrons on to the KC-97L. Two of these began conversion in 1970, while the other three commenced in 1972. Hayes was again contracted, this time to modify a further 26 KC-97Gs to L model configuration. These were former SAC aircraft that had been stored at the Military Aircraft Storage & Disposition Center (MASDC) at Davis-Monthan AFB in Arizona. The aircraft were restored to airworthy condition by MASDC personnel before being ferried to Hayes at Birmingham for their upgrades. The first was

53-0276, which departed MASDC on March 9, 1970, and the final examples were 52-2710 and 52-2728, both of which were completed on October 8, 1971.

Despite the KC-97L being capable of a service ceiling of 35,000ft (10,700m), the aircraft rarely achieved such lofty heights, and most refuelling missions were conducted at around 18,000–20,000ft (5,500–6,000m). The decision to station the aircraft at Rhein-Main was made as the airfield was central to the number of USAFE fighter bases in Germany. Later, air refuelling sorties were performed above Belgium and the North Sea, approximately 1hr of flying time from Rhein-Main, enabling USAFE receivers from the UK to avail themselves of *Creek Party* missions.

The operation was extremely popular with receivers from the USAFE fighter squadrons. Likewise, the refuelling units enjoyed *Creek Party* operations, the Ohio ANG's 145th ARS being involved in a "twinning arrangement" with the nearby community of Zeppelinhelm.

*Wisconsin ANG KC-97L 52-0902 at Mildenhall, Suffolk, on April 16, 1974. Tankers transiting from the USA to Europe frequently encountered strong headwinds or bad weather and were forced to divert to the British base, as on this occasion.*

BOB ARCHER







**LEFT** In June 1973 the mayor of Zeppelinheim, a small town across the main autobahn from Rhein-Main, christened KC-97L 52-2630 in the town's honour, its name being applied in Germanic writing above the crew entry door. The aircraft served with the 160th Air Refuelling Group of the Ohio ANG until 1976, when it was transferred to the Museum of the USAF at Dayton, Ohio, where it remains on display.

To commemorate this, KC-97L serial number 52-2630, the aircraft of the Ohio ANG's 160th ARG commander Col Frank Cattran, was inscribed with the word *Zeppelinheim* near the crew access door. The dedication took place on June 7, 1973, as a symbol of German-American co-operation and friendship.

### DRAW-DOWN

The USA's removal of most of its assets from South-east Asia following the cessation of combat operations in the spring of 1975 allowed vast numbers of KC-135s to return home and begin to be transferred to the ANG. This in turn permitted SAC and ANG KC-135s to rotate to Europe for conventional training sorties. The arrival of ANG KC-135s enabled *Creek Party* to finally draw to a close in the spring of 1977. By this time, the KC-97s were becoming increasingly difficult to maintain and more expensive to operate.

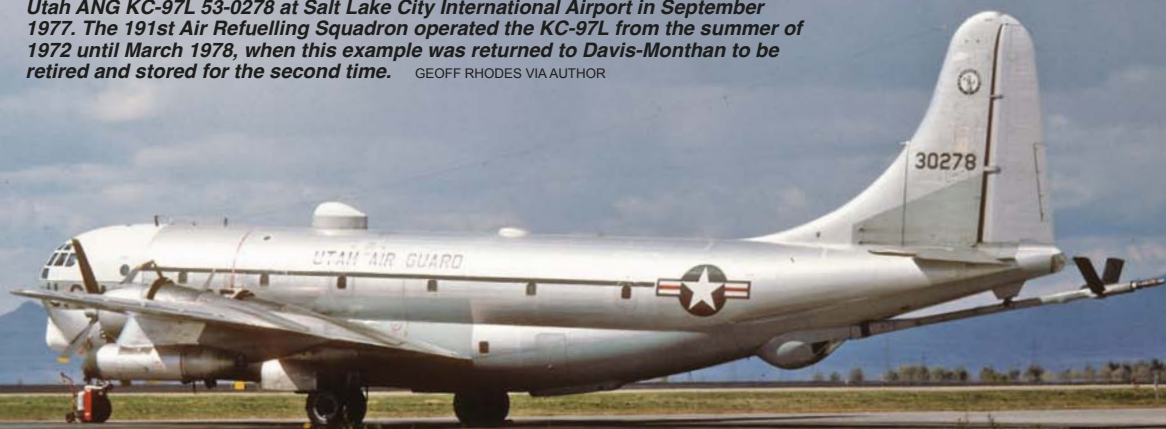
The operation officially ended on Thursday, April 28, 1977, with the Texas ANG's 181st ARS

performing the final sortie. The last two KC-97Ls to leave Rhein-Main were 53-0361 and 53-0296, which took off during the afternoon of April 29 for Keflavik, Iceland, and home.

The KC-97L rotation was active in Germany for two days short of ten years. In that time, the squadrons had flown 6,512 accident-free sorties, during which they had achieved 47,207 hook-ups and offloaded some 137,398,620lb (62,322,966kg) of fuel. Significantly, the entire operation was performed predominantly by volunteers and a number of full-time reservists, with no personnel called to active duty. Furthermore, *Creek Party* demonstrated that the Air National Guard could sustain an ongoing overseas rotation to support the active-duty USAF without resorting to mobilisation by the President or Congress.

The KC-97L and almost all the personnel associated with the aircraft have been retired, but the philosophy of using a volunteer force remains virtually unchanged today. The success of *Creek Party* contributed to the development of

**Utah ANG KC-97L 53-0278 at Salt Lake City International Airport in September 1977. The 191st Air Refuelling Squadron operated the KC-97L from the summer of 1972 until March 1978, when this example was returned to Davis-Monthan to be retired and stored for the second time.** GEOFF RHODES VIA AUTHOR








*This unusual gathering of types up from Luke AFB in Arizona represents three distinct eras of aviation history. Prop-driven KC-97L 53-0244 of the Arizona ANG refuels a classic late 1950s delta-winged jet fighter, Convair F-106A 59-0096, while the new kid on the block, McDonnell Douglas F-15A 73-0099, watches from the wings.*

the USA's post-Vietnam War "Total Force" policy, which has effectively integrated active duty and reserve components. The entire operation would not have been possible without the determination and dedication of the personnel who flew and maintained these iconic aircraft.

As one of the last remaining piston-engined aircraft to grace European skies routinely, the KC-97 was prone to showing its age, frequently spraying oil from its Wasp engines. Unlike the modern jet transports which were sleek and graceful in appearance, the KC-97's double-lobe fuselage was a unique feature of the Rhein-Main flightline. The Strat had a brutal beauty all of its own and, like most of the classic piston-engined prop-liners, made a distinctive squeal when the brakes bound during initial taxiing. Such sights and sounds are now just a distant memory. 

**ACKNOWLEDGMENTS** The author would like to thank Charles Gross, Geoff Rhodes, Dave Wilton and Gordon Wimmer for their help with the preparation of this feature

## THE ADDITIONAL KC-97 ANG UNITS

TO EASE THE personnel and airframe requirements of Operation *Creek Party*, an additional five Air National Guard units were converted to the KC-97L. They were:

### **102nd ARS, New York ANG**

KC-97L — March 1970 to September 1972

### **147th ARS, Pennsylvania ANG**

KC-97L — August 1972 to May 1977

### **180th ARS, Missouri ANG**

KC-97L — June 1970 to October 1976

### **191st ARS, Utah ANG**

KC-97L — June 1972 to March 1978

### **197th ARS, Arizona ANG**

KC-97L — August 1972 to July 1977

**THE PARTY CONTINUES OVERLEAF!** Richard Gardner recalls flying a mission with the KC-97Ls of the Ohio Air National Guard in June 1969 . . .



*The 888th and final C-97 built was 53-3816. After serving with Strategic Air Command's 19th ARS at Otis AFB in Massachusetts, it was retired in late 1965 and flown to Davis-Monthan to be stored. In 1970 it was converted to KC-97L configuration and served with the Pennsylvania ANG. It is seen here at Mildehall in July 1976.*

BOB ARCHER



*One of the sequence of photographs taken by the author while aboard an Ohio ANG KC-97L over Germany in June 1969. With the Bitburg-based McDonnell Douglas F-4D Phantom maintaining a position beneath the rear fuselage of the tanker, the flying boom (so named as it has flight control surfaces) is lowered before connecting to the receptacle aft of the Phantom's cockpit.*





**OPERATION CREEK PARTY:  
THE BOEING KC-97L IN EUROPE**

# A JAUNT OVER GERMANY

Continuing the history of *Operation Creek Party*, **RICHARD GARDNER** recalls a detour from the Paris Air Show in June 1969 to visit the Ohio Air National Guard at Rhein-Main, a diversion which afforded a rare opportunity to experience at first hand a typical air-to-air refuelling mission from the dependable piston-powered tanker's perspective

**D**URING MY TENURE at the Royal Aircraft Establishment (RAE) at Farnborough, a shared passion for aviation and scale aircraft modelling fostered a lasting friendship with Alan W. Hall, who at that time was Editor of *RAE News*. Over the next few years I supplied him with three-view drawings that were published in *Airfix Magazine*, in which Alan had developed a regular monthly series of articles on model-kit conversions and also monthly reports on military aviation developments.

In June 1969 Alan, I and John Bagley, another RAE incumbent who went on to play a significant role in the aviation department at the Science Museum, joined forces to visit the Paris Air Show. Knowing Alan's penchant for diverting to obscure French airfields along the way, I was not too surprised when he announced that we were to extend the tour across the border into Luxembourg, and a few hours later we found ourselves on an unexpected (but prearranged by Alan) visit to the USAF base at Bitburg in West Germany, which was mid-way through replacing its Convair F-102 Delta Daggers with new McDonnell Douglas F-4D Phantom IIs.





**ABOVE** One turning and one burning — the outer Pratt & Whitney R-4360 piston engine and the port General Electric J47 turbojet provide the foreground in another of the author's photographs from the KC-97L. The F-4Ds, up from Bitburg AFB, arrived in two pairs and carried no wing-mounted fuel tanks, nor ordnance on their wings.

The following day, and all part of Alan's plan to squeeze as much value as possible into the few days at our disposal, we were driven in grand style in a large USAF staff car to Rhein-Main air base at Frankfurt. This historic airport had become a major military air transport hub during the Berlin Airlift and later on, for USAFE air units during the Cold War period. In this role it continued as not only the main base for military passenger and cargo flights in support of German forces in Germany, but it also hosted regular detachments of KC-97Ls. Seeing these fascinating aircraft was a treat in itself, as the type was already well on its way towards retirement in the USAF as more KC-135s entered

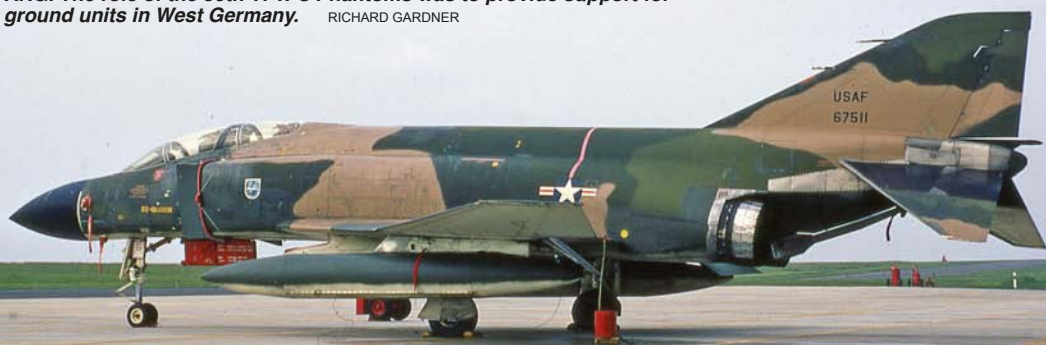
service, but the icing on the cake was that Alan had actually arranged for us to fly on an aerial tanking sortie over Germany.

### TO THE RACETRACK

The 160th Air Refuelling Group (ARG) of the Ohio Air National Guard, of which the 145th Air Refuelling Squadron (ARS) was part, was a reservist air-tanking group and provided several KC-97Ls on rotation at Rhein-Main to work with USAFE fighters based in Germany. On the sortie on which we flew the chosen receiver aircraft were the Bitburg-based F-4Ds we had visited the previous day.

The tanker crew was a mixed bunch, including

**McDonnell Douglas F-4D-30-MC Phantom 66-7511 of the 36th Tactical Fighter Wing (TFW) at Bitburg the day before the author's flight in a KC-97L of the Ohio ANG. The role of the 36th TFW's Phantoms was to provide support for Nato ground units in West Germany.** RICHARD GARDNER





commercial pilots more frequently employed flying scheduled domestic routes in the USA, as well as several members with completely contrasting careers, such as telephone engineers and postmen. They flew as a team in a highly professional manner and, just as in the Royal Auxiliary Air Force pre-1957, they demonstrated the enormous operational value of retaining reserve flying units alongside full-time air force personnel and aircraft. Our brief experience aboard the KC-97L was not incident-free.

With four (piston engines) turning and two (jet engines) burning, our fully tanked-up aircraft took off using only around one third of the massive length of Frankfurt's main runway, and we slowly climbed up to around 25,000ft (7,600m) to begin a "racetrack" pattern.

The cockpit area was just as one imagined the B-29 must have been like in the later stages of World War Two. Visibility was outstanding through the vast greenhouse front windows and there was time to clamber around to work out the best photo positions for when the receivers arrived. Luckily, there were plenty of cabin side windows on the main deck and below, as well as the boom operator's large bubble below the rear fuselage, from where the boom was controlled by small hand movements on a mini-joystick. The operator lay on his stomach in a padded "pit" in front of a large glass window, giving him a superb wide-angle view of any approaching receiver aircraft. There was space for another

person — on this trip, me — to squeeze in as well to capture some pictures over his shoulder (such as the dramatic image **ABOVE**).

### **GIVE IT A BONK!**

As the F-4Ds appeared in pairs in sunshine above the total cloud cover, they first formed just off the port wing and then, one at a time, slipped back to approach the boom. For the first three aircraft the operation went smoothly and the operator manoeuvred the heavy boom, which was stabilised by twin winglets, into the small receptacle situated just behind the rear crew member's canopy. The next Phantom was not so lucky. The receptacle hatch wouldn't open at first, so the boom operator gave it a gentle "bonk"! This resulted in an upward movement of the boom which was over-corrected and it came smashing down again, just a few feet behind the navigator's head. By now the receptacle could be seen to be losing its pristine paint finish, and the words of the F-4D pilot were becoming more colourful as the receptacle refused to open. Safety demanded that the aircraft pull back and return to base, as by now it was probably running short on fuel.

As the KC-97L navigator checked his map, a Lufthansa Boeing 727 suddenly appeared from directly under the aircraft, going considerably faster and rather close to the 1,000ft (300m) vertical separation required. It was certainly a German jaunt to remember!







Swedish aviation historian **JAN FORSGREN** details the complete history of one of the country's most obscure indigenous light aircraft — the ASJA Viking — a high-wing monoplane tourer developed specifically for a Stockholm newspaper in the early 1930s as a fast and efficient means of speeding the news into the headlines

# HOLD THE FRONT PAGE!

## the ASJA viking

**L**ITTLE-KNOWN OUTSIDE Sweden, the ASJA Viking tourer was built in very limited numbers. Indeed, only three were built; two in 1931 — which were designated Viking I — and the redesigned, larger and more powerful Viking II during 1934–35. At the time, the Vikings were much publicised in Sweden, two of them being used by the *Stockholms-Tidningen* newspaper and one being part-owned by *Svensk Filmindustri* (Swedish Movie Industries). The aeroplanes were also extensively used on flights around Sweden and Europe.

The Viking tourers were the first aeroplanes to be designed and built by ASJA, which went on to build nearly 100 aircraft, mostly foreign types under licence, including the Raab-Katzenstein RK-26 Tigerschwalbe, de Havilland D.H.82A Tiger Moth, Focke-Wulf Fw 44J Stieglitz and Hawker Hart. Only one other ASJA design was built, the Type 2 (L 2), two of which served with *Flygvapnet* (the Swedish Air Force) as the Ö 9. Incidentally, with Saab being established at Trollhättan in April 1937, it was expected that ASJA and Saab would design a combat aircraft and a trainer, 130 and 35 of each to be produced

respectively. In March 1939, however, ASJA merged with Saab, with the ASJA L 10 eventually entering production as the Saab B 17 single-engined light bomber.

### From trains to aeroplanes

The story of the Viking begins in the summer of 1930, when aircraft designer Sven Blomberg suggested the establishment of an aircraft manufacturing factory to Erland Ugglå, the managing director of *AB Svenska Järnvägsverkstäderna* (Swedish Railway Works Ltd — ASJ). Established at Linköping in 1907, ASJ was a major manufacturer of railway stock. During the mid-1920s the company became part of the growing industrial empire of Ivar Kreuger (of tobacco company Swedish Match fame), whose brother, Torsten, was on the board of ASJ.

With ASJ suffering from a lack of orders, Blomberg's idea was met with approval, both by Ugglå and Kreuger. As a result, a new department of ASJ, *Aktiebolaget Svenska Järnvägsverkstäderna Aeroplanavdelningen* (ASJA), was formed, the new company quickly receiving an order for licensed production of the RK-26 Tigerschwalbe advanced training biplane. However, before

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**OPPOSITE PAGE** A rare air-to-air photograph of the second Viking I, SE-FYR, over Stockholm in the early 1930s, taken by Swedish aerial photography pioneer Oscar Bladh. Architect Ragnar Östberg's distinctive City Hall building, with its prominent 350ft (106m) tower, is at the bottom right-hand corner of the photograph. VIA AUTHOR



**ABOVE** The first Viking I after the application of its test registration, SE-95. A May 1931 report in *Flight* described the type as having a “strong resemblance to such British machines as the Puss Moth and Desoutter monoplane”, the latter being somewhat nearer the mark than the former. *Flight* also described it as “a very creditable effort”.

production began, Blomberg, whose previous employers included Hanriot and Svenska Aero, suggested the design and construction of an aircraft to be used by *Stockholms-Tidningen* specifically as a convenient and quick way of transporting a journalist to events of news value. With the Kreuger brothers having large owner interests in the newspaper, the idea was met with enthusiasm.

Assigned the project designation L 1, the design, of thoroughly orthodox construction, was a high-wing monoplane with an enclosed three-seat cabin and fixed undercarriage, powered by a 105 h.p. Cirrus Hermes IIB inline engine. The steel-tube fuselage was fabric-covered, as were the wooden wings. To conserve

hangar space, it was possible to fold the wings. The wheeled undercarriage featured telescopic legs with oil-damped springs and incorporated wheelbrakes.

The name Viking was chosen to reflect connotations of seaborne Scandinavian raiders a millennium earlier. This airborne Viking would also visit many different places around Europe, albeit in a somewhat more peaceful manner.

### Test flying begins

Construction proceeded quickly and the Viking I (c/n 1) was publicly shown in May 1931 at the International Aero Exhibition in Stockholm. At this point the machine had not yet made its maiden flight. Swedish aviation magazine

**The second Viking I, SE-FYR, fitted with a Czechoslovakian Walter radial engine. Note the legend *Stockholms-Tidningen* on the fuselage and the newspaper's logo on the fin.**





**ABOVE** Another photograph of the second Viking I, SE-FYR, this time fitted with skis. The cabin was arranged with a single seat in front for the pilot, and a bench-type seat for two behind the pilot's seat. Luggage could be stowed in the space behind the passengers' seat. The wings, braced by steel-tube vees, were foldable to aid hangarage.

*Flygning* rather inaccurately described the Viking I as being "to a certain degree a copy of the English [de Havilland] Puss Moth". On July 13, 1931, temporary test registration SE-95 was assigned to the new lightplane.

With the ASJA company airfield yet to be completed, test flights of the Viking I were conducted at Malmslätt, in the hands of Lt Nils Söderberg. Initial test flights showed that the Viking I had good flying characteristics. It was soon determined, however, that it was seriously underpowered; when the aeroplane was fitted with floats, Söderberg failed to get airborne in calm conditions. Later, in a heavy rain squall, Söderberg managed to take off from Lake Roxen, near Linköping, only to have to set the machine down in a soggy field. The aircraft was not damaged, but was returned to the ASJA workshops where the floats were exchanged for a wheeled undercarriage.

The Cirrus Hermes engine was also exchanged for a 145 h.p. Walter Mars I. Sweden's 90,000 lakes, as well as many rivers, made the ability to operate on floats an essential requirement for the aircraft. During winters, the Viking I was often flown on skis. In 1932, the Viking I was offered to Flygvapnet, but the air arm showed no interest in the type.

Following the completion of its flight trials, the Viking I was given the civil registration SE-ACX on June 23, 1932. It was sold to Erik Witte, the managing director of the company *Reklamflyg* (Commercial Flying) a little more than two weeks later, on July 8. Witte named SE-ACX *Den Flygande Draken* (The Flying Dragon), and on June 3, 1933, a more powerful Walter Gemma engine of 160 h.p. was fitted.

During 1933 SE-ACX completed about 300 flying hours over 1,100 flights. Some 2,000 passengers were carried during exhibition flights. Stavanger in Norway was visited for the delivery of mail and newspapers to the Atlantic liner *Drottningholm*.

While preparing for take-off from Västerås harbour on May 1, 1934, SE-ACX was struck by the steamer *Apollo*. The three aboard the aircraft, including the Norwegian pilot, escaped unscathed. The Viking I was damaged beyond repair, however, with only the propeller, engine and starboard float remaining intact. Viking I SE-ACX was deleted from the register on November 5, 1934.

### A second Viking I

A second aircraft was built in 1931 (c/n 2), and was registered as SE-FYR to *Stockholms-Tidningen* on September 5, 1931. The out-of-sequence registration could be read as *Sefyr*, meaning westerly wind. According to *Stockholms-Tidningen*, SE-FYR was the world's first aeroplane acquired specifically by a newspaper to ease travel and speed the delivery of news stories and photographs. In order to ease journalist Birger Brinck's job, a typewriter was carried in the cabin. The aircraft was usually flown by Åke Söderberg (the brother of Nils), who would be accompanied by Brinck.

Not long after its delivery SE-FYR was flown to Saxtorp in southern Sweden to cover the Swedish Grand Prix. Other flights included two visits to Coburg in Germany to cover the engagement and marriage of Prince Gustaf Adolf and Princess Sibylla. An extensive tour of the Baltic countries was also completed successfully,





**ABOVE** Looking rather more modern than its predecessor, the sole Viking II, also registered SE-FYR, is seen here on floats bearing the legend Svensk Filmindustri on the fuselage and the Stockholms-Tidningen logo on the rudder. Behind it is the sole de Havilland D.H.83 Fox Moth exported to Sweden, SE-AFL, originally G-ABZN.

as was a trip to Italy. The aircraft visited some 13 countries during its relatively short career.

On August 9, 1934, SE-FYR was written off as the result of a forced landing near Drevviken, a lake in southern Stockholm. When the engine began to run rough, Söderberg managed to set down the float-equipped Viking I in a rye field. Söderberg survived without a scratch, but SE-FYR was damaged beyond repair. The machine had accumulated an impressive 1,300 flight hours.

Following the loss of the aircraft, *Stockholms-Tidningen* wrote: "The management of *Stockholms-Tidningen* owes a huge debt of gratitude to the Viking, its pilot and reporter. It has without a doubt shown the way towards quicker and more modern news coverage for a major newspaper. The Viking has made Swedish media history, and as a pioneer shall always be honoured and revered".

### The Viking II

The loss of SE-FYR did not deter *Stockholms-Tidningen* from acquiring a second Viking. The same day as SE-FYR was lost, registration SE-ADY was reserved for another example. The task of designing a similar but more capable aeroplane went to young designer Bo Lundberg,

who went on to design Sweden's indigenous FFVS J 22 fighter.

The third Viking (c/n 37) emerged in early 1935, registration SE-FYR being reissued on February 14, 1935. However, *Stockholms-Tidningen* did not become sole owners of the Viking II, with Svensk Filmindustri (Swedish Movie Industries) also acquiring a share in the aeroplane. *Stockholms-Tidningen* initiated a contest to choose a name for the aeroplane, which was provisionally called *Viking II*. In the event, despite some 25,000 people contributing a plethora of suggestions, the name *Viking II* stuck.

Although essentially similar in construction to its predecessor, the Viking II was larger, having four seats. It was powered by a 205 h.p. de Havilland Gipsy Six engine. The new SE-FYR soon became a common sight around Sweden. Apart from regular news flights, it was also a regular visitor to airshows around Sweden, often carrying passengers on short air-experience flights. As had been the case with the Viking I, the Viking II could be operated on wheels, floats or skis.

Following the German invasion of Denmark and Norway on April 9, 1940, a number of privately-owned light and transport aircraft, including four Junkers Ju 52/3ms of Swedish

airline AB Aerotransport, and Miles Falcon SE-AFN, were taken over by Flygvapnet. The handover terms varied, with some being purchased outright, while others were leased or, in a few instances, donated.

### Flygvapnet rejection

The Viking II was leased on June 7. Two weeks later, on 21 June, it was decided to allocate Flygvapnet designations to the aircraft concerned. The Viking II was allocated the designation Trp 9 (Trp being short for Transport, soon afterwards amended to Tp), and assigned to Wing F 2. However, following a close inspection of the aircraft, it was deemed to be in too poor condition to be incorporated into Flygvapnet service, and the leasing contract was annulled. (The designation Tp 9 was reassigned to Junkers Ju 86Z SE-BAE.)

The Viking II remained in civilian ownership, and was purchased on March 26, 1941, by AB Björkvallsflyg of Stockholm. On September 20 the same year, the company AB Wiklund became the registered owner of the rather tired SE-FYR. However, by this time, it was clear that its flying days were definitely over. The aircraft's registration was cancelled on September 24, 1941, and the machine — the last of the Vikings — was scrapped.



## ASJA Viking data

### Powerplant

**Viking I** 1 x 105 h.p. Cirrus-Hermes four-cylinder air-cooled inline piston engine. Later 1 x 145 h.p. Walter Mars 14-cylinder air-cooled radial engine

**Viking II** 1 x 205 h.p. de Havilland Gipsy Six six-cylinder air-cooled inline piston engine

	Viking I	Viking II
<b>Dimensions</b>		
Span	11.2m (36ft 9in)	12.4m (40ft 8in)
Length	8m (26ft 3in)	8.6m (28ft 3in)
with floats	8.2m (26ft 11in)	—
Height	2.4m (7ft 10½in)	3.1m (10ft 2in)
with floats	3m (9ft 10in)	—
Wing area	22m² (237ft²)	21.8m² (235ft²)
<b>Weights</b>		
Empty	265kg (584lb)	695kg (1,532lb)
with floats	—	805kg (1,775lb)
Loaded	650kg (1,433lb)	1,180kg (2,602lb)
with floats	—	1,205kg (2,657lb)
<b>Performance</b>		
Max speed	165km/h (103 m.p.h.)	230km/h (143 m.p.h.)
Cruising speed	150km/h (93 m.p.h.)	—

*The Viking II with a wheeled undercarriage operating from the frozen Lake Grövelsjön on the border between Norway and Sweden. Built to be robust and powered by a 205 h.p. D.H. Gipsy Six engine, the Viking II nevertheless had a comparatively short career, operating for a mere seven years before being withdrawn from use and scrapped in 1941.*

VIA AUTHOR







*The second of the two EWR VJ101Cs, known as X2 and given the registration D-9518, is prepared for a flight at Manching during its test-flight programme.*





# “we wanted to do something challenging...”

## WEST GERMANY'S COLD-WAR AMBITION & THE VJ101

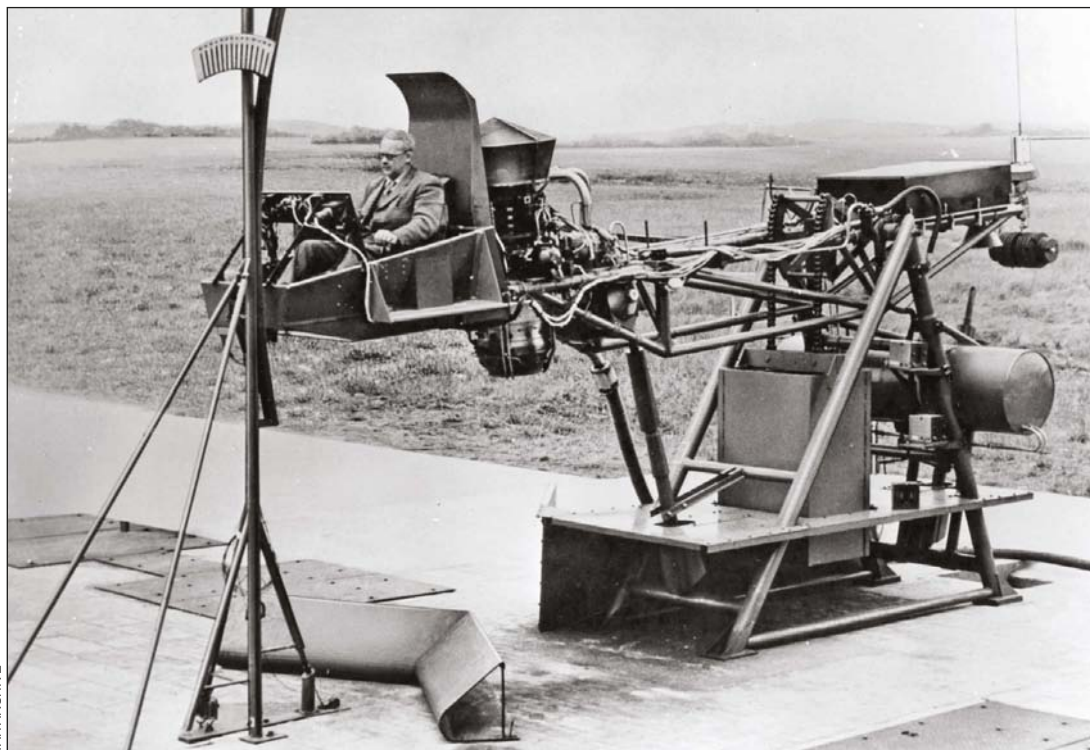
Rising from the ashes of the Second World War, the West German aviation industry was determined to announce its re-emergence as a world-class technological power, and set about developing a number of highly ambitious Cold War projects. **Dr ANDREAS ZEITLER** traces the history of EWR's supersonic VJ101 jump-jet and, exclusively for *TAH*, talks to Nils Meister, one of the few test pilots to fly the aircraft

“SIT IN THE aircraft on the ground, start rolling, and my heart rate is normal at 90 beats a minute; it quickens to 110 beats a minute — then the engine nacelle rotates perpendicularly; the moment I push the throttle forward my heart rate skyrockets to 200 beats a minute.” Test pilot Nils Meister's recollections of flying the EWR VJ101C are as fresh today as they were half a century ago, when he was tasked with undertaking trials of Germany's highly ambitious supersonic VTOL aircraft.

“We had nothing at all”, says the former test pilot of the post-war West German aviation industry. Although the Luftwaffe, which was reactivated in 1955, received help from its Nato allies with the supply of Canadair CL-13 Sabres, Republic F-84s and, for pilot training, Canadian-built Harvards, it was still inconceivable in the late 1950s that West Germany could design a new large combat aircraft and put it into series production.

The industry would have to learn to stand on its own feet again, and it would be a slow process. Much of the Luftwaffe's equipment was supplied under the provisions of the Mutual Aid Programme (MAP), which covered the supply of a total of some 2,000 aircraft, with another 600–700 for West Germany's other air arms. The MAP was to play a major part in the revival of the West German aviation industry, with overhauling of the new aircraft and licence-production becoming central pillars in the nation's military renaissance. Several types,





**ABOVE** The first stage in the development of the VJ101C was the Wippe (see-saw), a simple frame into which a single Rolls-Royce RB.108 engine and cockpit were incorporated in order to investigate the use of thrust modulation for primary control of the aircraft. The seat could also be turned sideways to simulate roll-axis conditions.

including the French Fouga CM-170 Magister jet trainer, Nord Noratlas transport and Italian Piaggio P.149 basic trainer were built under licence by West German companies.

In addition, new projects were mooted, as Nils Meister explains: "We started a number of developments from virtually nothing, hoping that these might serve as a basis for something more ambitious in the future. One of these ideas was to build a pure testbed; perhaps a project that could lead to something that nobody else had to offer at the time".

Budgets were constrained and resources were scarce in West Germany in the late 1950s, and although this new testbed project was intended principally to be a technology demonstrator, there was nevertheless a military and political purpose behind it.

## NOISY NEIGHBOURS

Within ten years of the end of the Second World War, Europe was at peace, albeit a fragile and nervous one, with the divisions between East and West at their strongest. The frontier between the two conflicting ideologies had hardened, with both sides seeking to maintain the advantage in the "Balance of Terror". The Korean conflict of 1950–53, although far away from the forests and plains of mainland Europe, had been

watched keenly by both sides, each anxious to learn valuable lessons that could be turned to advantage in any potential European conflict. A fear of aircraft being attacked while sitting helplessly in their shelters was all-pervasive. To add to these concerns the Soviet Union had skilfully misled the West into believing in a "bomber gap", in which hordes of opposing Sukhois, MiGs and Tupolevs were ready to deploy at a moment's notice — it was, in fact, all smoke and mirrors. Another major concern was the introduction of long-range ballistic missiles, which, it was feared, would rain down on the vulnerable infrastructure of airfields and make them useless within minutes.

To counter the latter concerns, the concept of vertical take-off and landing (VTOL) aircraft was investigated as a matter of urgency, particularly in light of the fact that the establishment of the Warsaw Pact on May 14, 1955, saw the German Democratic Republic (East Germany) become part of the Eastern Bloc under direct Soviet influence, a move made in response to West Germany's joining of Nato a week before.

Membership of Nato brought protection, but also obligations. For example, in the case of an emergency, the Luftwaffe would be tasked with attacking enemy airfields, with other Nato members taking responsibility for the



interception of Soviet bombers. By the mid-1950s the Luftwaffe's Thunderstreaks and Sabres were showing their age, so a search for a multi-role aircraft capable of fulfilling the interceptor/air superiority, fighter-bomber and reconnaissance roles was put in train. An indigenous design was beyond the capabilities of West Germany at the time, so the Luftwaffe turned to the UK, France, Sweden and the USA to fulfil its need for a new multi-role combat aircraft. The decision ultimately went to the USA's Lockheed F-104 Starfighter in November 1958.

### HOMEOWN AMBITIONS

Back in November 1956 West Germany's *Bundesministerium der Verteidigung* (BMVg — Ministry of Defence) had sought to kickstart the nation's aviation industry by issuing a request to develop an indigenous modern interceptor aircraft for the point-defence role. The prospective interceptor had to be able to react rapidly to alerts and be able to climb to high altitude very quickly.

Professor Gero Madelung, at the time a young engineer, traces the development process of the new machine: "A classic industrial approach would have been to build a trainer aircraft, but the government exerted pressure on the procurement committee to select a foreign

aircraft [the Fouga Magister] for that role. There was also a philosophy that in order to draw attention to our industry after a ten-year break, we wanted to do something challenging. Designing and building a trainer aircraft would not have sufficed. Messerschmitt was a very ambitious company and wanted to build something special. The VTOL project was exactly that, especially as the concept was much in vogue in that era; France had the Snecma C-450 Coléoptère, the UK had the Short SC.1 and the Americans were developing the Ryan Vertijet".

The specification for the ambitious new project stipulated a range of up to 435km (270 miles), a service ceiling of 20,000–22,000m (66,000–72,000ft) and a maximum speed of Mach 2.5. Looking at this performance data it is easy to see why the VJ101 project has often been described as a successor to the F-104G, despite the latter not being selected for Luftwaffe service for another two years.

To add to an already demanding specification, V/STOL (vertical/short take-off and landing) capability was added to the list of requirements in February 1957, in view of the concerns that the destruction of West Germany's airfields would be high on the list of Soviet priorities in the case of an escalating conflict, it being given that the

*Following successful trials with the Wippe, the next stage was to construct a "flying bedstead" for hovering trials. This incorporated three RB.108s in the same geometric locations as proposed for the VJ101C prototypes. After trials on a telescopic arm the rig made its first free flight, in the hands of George Bright, in March 1962. Note the "sail" fitted on its underside to simulate the keel area of the aircraft to determine ground-effect characteristics.*

AIRBUS CORPORATE HERITAGE







AIRBUS CORPORATE HERITAGE

**ABOVE** The first prototype VJ101C (X1) before the fitting of its non-afterburning wingtip nacelle-mounted RB.145 engines. The VJ101C was of light-alloy construction, but in the hot regions near the fuselage-mounted engines, titanium and steel were also used. The continuous multi-spar wing was attached to the fuselage by six bolts.

technical feasibility of such an aircraft had been proven. Contemporary jet engines had proved that they were capable of providing some 70 per cent of the required power for vertical take-off, and it was assumed that, considering the rapid technical progress of the era, sufficiently powerful engines would be available within a short timeframe. With this ambitious but exacting specification tendered to industry, the BMVg saw itself as being prepared for the future and awaited the proposals of Bölkow, Heinkel, Messerschmitt and Focke-Wulf.

### THE CONCEPT TAKES SHAPE

The designs supplied to the BMVg suggested various configurations, including swivelling engines mounted on the wingtips and lift engines installed in the fuselage. The first drafts were promising and the BMVg deemed the project to be technically viable. There was insufficient funding, however, to pursue each of the suggested approaches and so, as a basic condition in return for a development contract, it was decreed that a working group formed from representatives of the three companies based in the south of the country would be created.

In 1959 management representatives of Ernst Heinkel Flugzeugbau GmbH, Messerschmitt AG and Bölkow GmbH met in an office of the library

at the Deutsches Museum in Munich to negotiate a plan for the development of the project. This was the birth of *Entwicklungsring Süd* (EWR – Development Ring South). The negotiations concluded in mid-1959 with a preliminary agreement. Development of the *Versuchs Jagdflugzeug* (Experimental Fighter Aircraft), to be designated VJ101, could begin.

A technical framework for the new project was laid out as follows:

- in contrast to “tail-sitting” VTOL projects being developed elsewhere — the Ryan X-13 Vertijet and Snecma Coléoptère for example — the VJ101 should be equipped with rotatable thrust and should resemble the classic fighter jet in its configuration;
- to be capable of the specified supersonic speed, a slim aerodynamic form would be imperative;
- the aircraft’s vertical take-off ability should be equivalent to a power/weight ratio larger than 1:1. To achieve this, the employment of an afterburner would be required, which would also guarantee supersonic climb to height;
- controllability in hovering flight must adhere to the requirements of the AGARD FMP (Advisory Group for Aerospace Research & Development, Flight Mechanics Panel);
- the aircraft’s take-off weight should not exceed



**ABOVE** Both VJ101Cs — this is the second, X2 — were mounted on a test pedestal for trials. The aircraft was tethered at the centre of gravity with freedom of movement about all three axes, then put through an extensive series of trials, including nacelle-swivelling and automatic throttle controls for the lift engines during transitions.

10 tons, for both technical and financial reasons.

The merger of the three companies into EWR saw the establishment of several development offices, all of which examined the requirements and produced various concepts. The VJ101A incorporated four swivelling afterburning jet engines placed on the tips of the wings and the tailplane, whereas the VJ101B featured two pure-lift jets in the fuselage alongside four engines for cruise flight, the latter being capable of some degree of vectored thrust. A common factor of these concepts was the comparatively high number of engines installed, the theory being that smaller engines provided a better power/weight ratio.

In April 1959 EWR decided that airframes incorporating the VJ101A and -B concepts would be built and tested before work on the final, definitive prototype would begin. However, this decision was rescinded by the BMVg, which announced that there would be one final draft, which would become the VJ101C. The new single design was unveiled on September 22, 1959, and incorporated elements of both the previous versions, although the VJ101A's tiltable wingtip engines were clearly the strongest influence. In order to ensure controllability in hovering flight and to provide the necessary thrust for vertical take-off, two lift engines were

installed in the fuselage behind the cockpit to supplement the wingtip powerplants.

Gero Madelung, then working as a young engineer in the VJ101 development team, remembers how "the chief engineer of Rolls-Royce went pale when he saw the planned installation of the engines for the first time". The installation of six jet engines in such a restricted space was indeed unusual, but at the time it was the only way to achieve the power/weight ratio required for vertical flight.

There was also another reason, as Madelung explains. The designers would have preferred to forego such a complex system, but "our problem was that we had not yet invented a stabilised ejection seat like the 'zero-zero' seats of today. If we had, we would have been able to build the VJ101 with only three engines [one in each wingtip nacelle and one behind the cockpit]. It would have been a lot more practical.

"We put six engines in it to incorporate some redundancy in case of engine failure. It was a safety concept. With only three engines, the aircraft would have lost height fairly rapidly [in case of an engine failure], but the pilot would have been able to eject".

Extensive windtunnel testing was undertaken to investigate the effects of "recirculation", in which hot exhaust gases re-enter the engine and



**"Our choice of the multi-engine configuration is necessary because we want to fly **NOW** in a performance regime that will not be possible with a single engine for several years to come . . ."**

***EWR chief test pilot  
George Bright, 1964***

lead to a loss of thrust and potentially damage the engine. Computer technology was still in its infancy and developing a flight-control system, particularly for hovering flight, would present a major challenge. Flight simulations were used as a vital research tool, and a "levitation rack", similar to Rolls-Royce's "flying bedstead", was built for hovering trials.

Design and production of this testbed began in 1959 and had been completed by the beginning of 1962; it made its first free hovering flight on March 13 that year. It would continue to make experimental flights throughout the VJ101 programme, eventually accumulating more than 14hr of flying time over 126 hovering flights, ten different pilots experiencing their first jet-powered vertical take-offs.

Before the flying test-rig had flown, an earth-bound test rig known as the *Wippe* (seesaw) had been built and "flown". The apparatus was mounted on a pivot point at one end and free to move up and down at the other. A single Rolls-Royce RB.108 engine and a pilot's cockpit were included in the same geometric relationship to that of the VJ101, and EWR's American chief test pilot, George Bright (seen in the X1, **ABOVE**) used the rig extensively to investigate thrust modulation for the primary control of the aircraft and to test various stability augmentation systems.

As a result of tests with the *Wippe* it was decided to incorporate triple-redundancy in the control system, the human decision-making process being too slow in a single-redundancy system to provide sufficient stability. The pilot was essentially removed from the control chain, the flight control system being fed by a system of gyroscopes for attitude and height measurement. A pitot tube was omitted, as it was superfluous for hovering flight.

Running parallel with the *Wippe* and flying test-rig trials was the development of the two prototype VJ101C airframes, which were designated X1 and X2. The former was intended to test the lower-speed portion of the flight envelope, concentrating on the hover and transition regimes, with the X2, which was equipped with afterburning engines and increased fuel capacity, taking over for high-speed trials and further VTOL research with afterburning engines.

### **THE VJ101 PROTOTYPES**

By the end of 1962 the X1 was complete and was delivered to Messerschmitt's flight-test facility at Manching, 45 miles (70km) north of Munich, while construction of the X2 continued. The test programme began in early 1963 and the first free hovering flight took place on April 10, 1963, with the first transition from hovering to horizontal flight following on September 20 the same year.

Testing continued with the non-afterburner-equipped X1, the aircraft apparently breaking through the sound barrier on July 29, 1964. This first supersonic flight could not be verified, however, as, although the VJ101C's instruments indicated a speed of Mach 1.04, the two F-104 Starfighter chase aircraft recorded only subsonic speeds during the same flight, so the X1's achievement was never officially recognised.

On September 14, 1964, the VJ101C project was dealt a harsh blow when a faulty yaw-control gyroscope in the X1 resulted in a loss of controllability shortly after take-off. George Bright was at the controls; Nils Meister explains what happened:

"Bright started normally, but two-thirds of the way down the runway the aircraft began an uncommanded roll. Bright reached for the

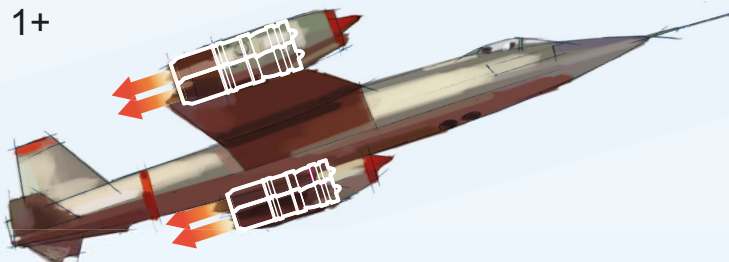


# The VJ101C

From standstill to supersonic – how EWR's experimental fighter flew from a hover to Mach 1+

## In conventional flight

The second VJ101C prototype, X2, was powered by a total of six Rolls-Royce RB.145 turbojets; two fuselage-mounted lift engines behind the cockpit and four afterburning engines located in pairs, one on top of the other, in wingtip-mounted nacelles



## Transition to the hover

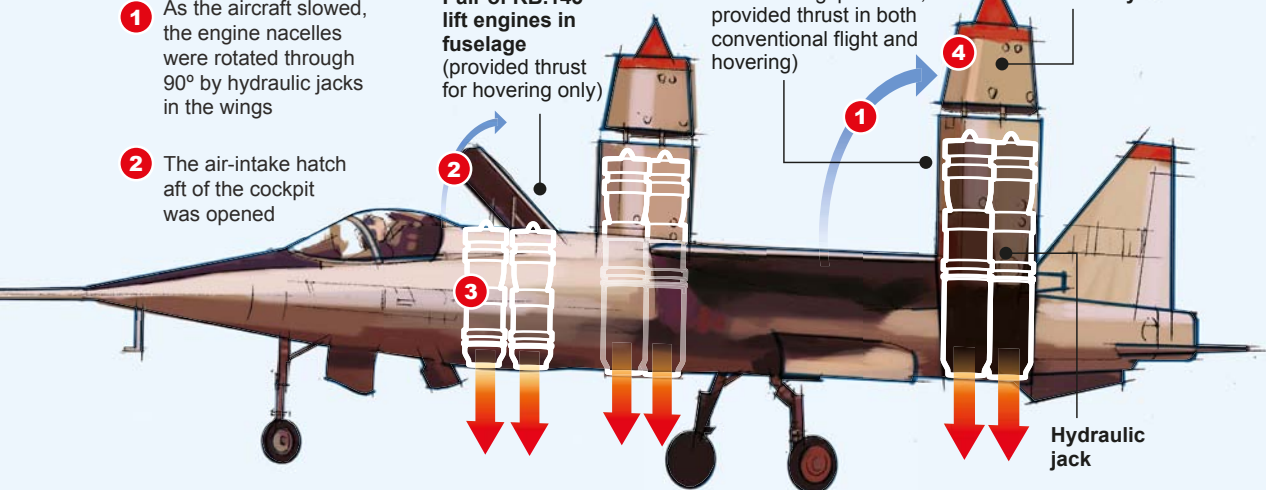
**1** As the aircraft slowed, the engine nacelles were rotated through 90° by hydraulic jacks in the wings

**2** The air-intake hatch aft of the cockpit was opened

**Pair of RB.145 lift engines in fuselage** (provided thrust for hovering only)

**RB.145 engines** (two in each wingtip nacelle, provided thrust in both conventional flight and hovering)

**Movable intake assembly**



**3** The hatch allowed airflow to two further RB.145 engines in the fuselage which provided lift for hovering

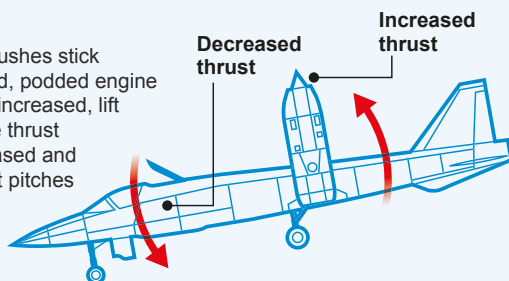
**4** The podded engines also needed extra airflow while hovering, so the whole intake assembly moved forward to create an extra intake slot

## How the VJ101C was manoeuvred in the hover

Linkages between the control column and throttle enabled the pilot to control hovering pitch and roll

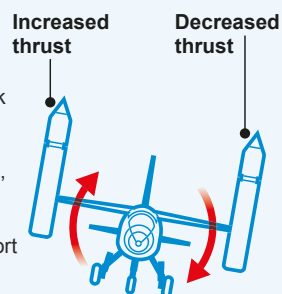
### Pitch

Pilot pushes stick forward, podded engine thrust increased, lift engine thrust decreased and aircraft pitches down



### Roll

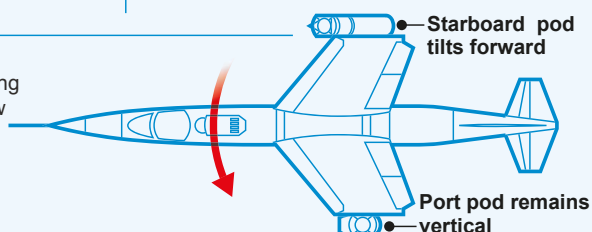
Pilot pushes stick to port, port podded engine thrust decreased, starboard increased and aircraft rolls to port



### Yaw

Linkages between the rudder pedals and engine tilting mechanism enabled the pilot to control hovering yaw

Pilot pushes left rudder pedal, starboard engine pod tilts forward and aircraft yaws to port



Graphic: Ian Bott [www.ianbottillustration.co.uk](http://www.ianbottillustration.co.uk)



**ABOVE** The flap of the air intake for the two Rolls-Royce RB.145 lift engines would be opened during hovering and transitions to and from aerodynamic flight. **LEFT** Engineers inspect the port engine of VJ101C X1. The nacelles were attached to the wing by means of a hollow shaft which passed through the nacelles between the engines.

ejection-seat handle, but quickly realised that if the roll continued he would eject directly downward on to the runway. Fortunately, by the time the ejection sequence had started the fuselage had rolled around to 45° from the vertical before he shot out, gaining just enough height for his parachute to deploy fully before he hit the ground."

Bright suffered spinal injuries as a result of the accident. Meister remembers: "George was never the same again. I visited him a couple of times in the USA, and he was less fired-up than he had been before, but he was also much calmer. The VJ101 was his last project. Looking back, we were lucky to have George — he was the best test pilot we could have wished for".

Including the accident, the X1 had performed a total of 132 trial flights, which included pure

hovering flights, horizontal aerodynamic flights and transitions. It had been a promising start and the loss of the X1 and Bright from the programme hit the project hard. There was good news too, however, in the form of the arrival of the X2 at Manching, enabling the flight programme to continue. Meister, a former Luftwaffe F-84 pilot, had recently joined Bölkow, and found himself at the right time and place to be selected as a pilot for the new project.

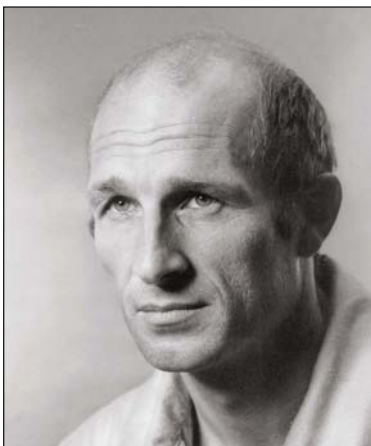
The EWR consortium had provided three test pilots for the VJ101 project; George Bright, Ludwig Obermeier, and Hansfriedrich "Fred" Rammensee. Meister recalls his introduction to the programme:

"Bright had the X1 crash and was still suffering from problems with his back, and so was included only at the very beginning of the X2

**Firemen surround a disconsolate-looking X1 following the accident in which George Bright was forced to eject from the aircraft on September 14, 1964. The machine was damaged beyond repair and was retired from the VJ101C programme.**

AIRBUS CORPORATE HERITAGE





**ABOVE** Test pilot Nils Meister was one of the few to fly the VJ101C, and went on to make the first flight of the Panavia Tornado with Paul Millett in August 1974. **RIGHT** The well-organised cockpit of the X1 featured basic flight instruments on the upper panel with engine dials below.



programme. Rammensee was the senior pilot but at that time was at the test pilot school. Obermeier was in Bremen to fly the test rig of the VFW VAK-191 [another West German VTOL project], so it was down to me to fly the VJ101."

Meister had little experience of flying VTOL aircraft, as he explains: "I acquired a helicopter licence, which took about 20hr, and which helped a great deal. I flew the flying test-rig, and also went to Bremen to fly the VAK-191 test-rig. Both rigs saved a lot of money and avoided losses. It was a great step, from having nothing to some form of attitude- and speed-control practice. It made hovering in the VJ101C relatively riskless and even pleasant."

Thus Meister was well prepared for the first flights of the X2, which differed from the X1 in being fitted with Rolls-Royce/MAN RB.145

engines with afterburners, which were necessary to achieve supersonic flight, and increased the thrust on ground from 2,750lb-thrust to 3,650lb-thrust. Unlike most jet engines, in which the afterburner can only be selected after reaching full power, the RB.145's afterburner could be engaged over the whole thrust range, a feature that would be crucial for VTOL take-offs and landings. The X2 made its first transition from vertical to horizontal flight on October 22, 1964.

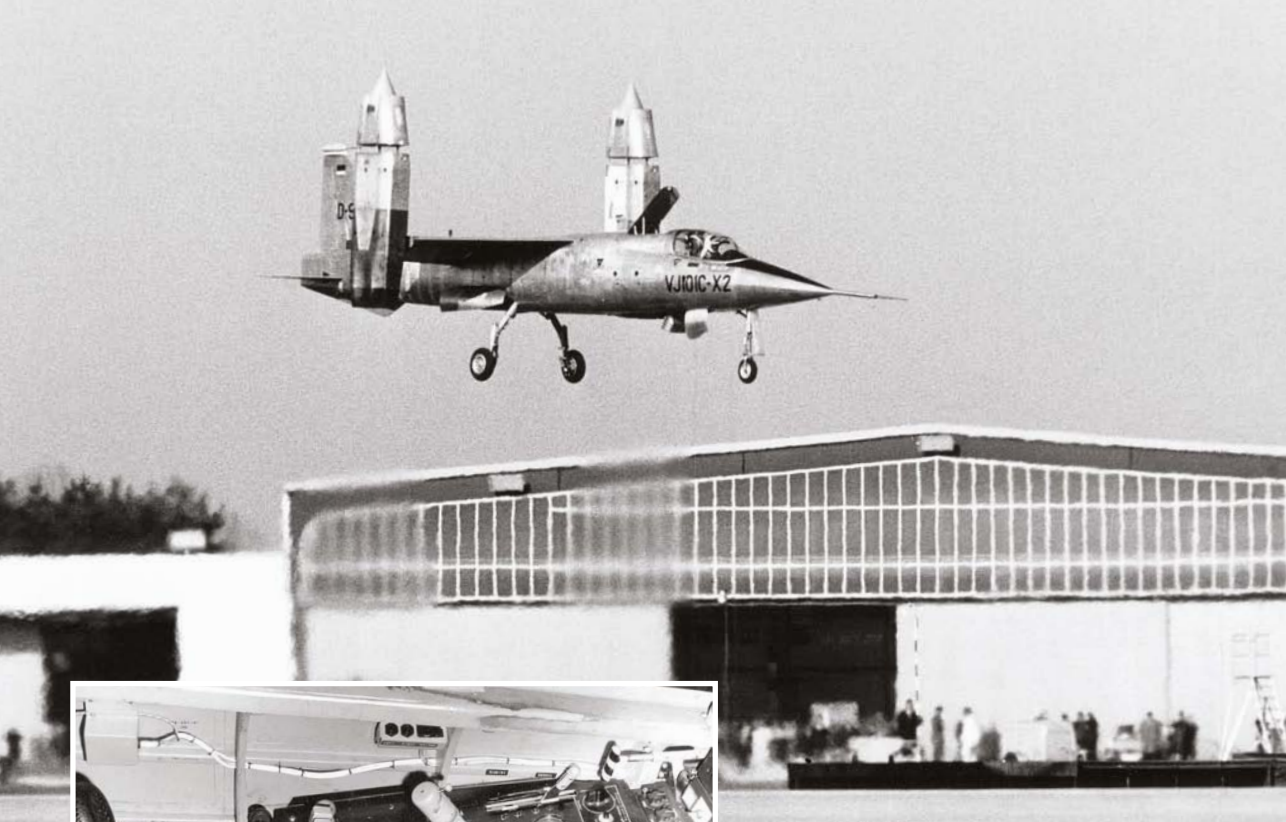
### FLYING THE X2

Nils Meister recalls the technique he developed for take-off in the X2: "Taking off vertically without the afterburners was not possible, because the aircraft was too heavy". In addition, the runways from which the VJ101C was operating were not made to withstand such

**The second VJ101C, X2, at Manching in 1969. Designed as an experimental fighter, the VJ101C pre-dated the VFW VAK-191, which was developed as a potential VTOL aircraft for the nuclear strike role, and which first flew in September 1971.**



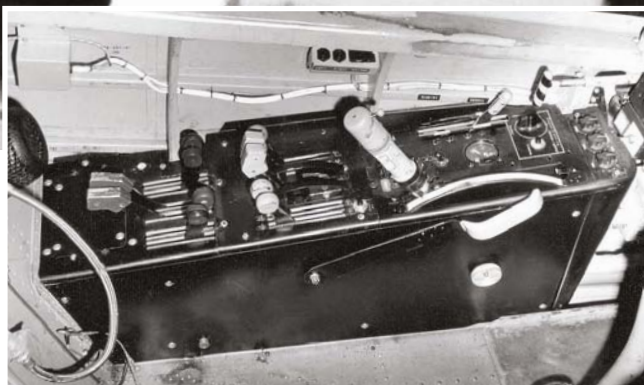




AIRBUS CORPORATE HERITAGE x 2

**ABOVE** *The X-2 during hovering trials at Manching. Note how the wingtip nacelles are in the VTOL position, in which the entire intake section slides forward to improve air ingestion at oblique angles.*

**LEFT** *The three pairs of engines were linked to a common throttle lever located at the forward end of a box on the port side of the cockpit, as seen here in the X1.*



temperatures and there was a concern that debris from the runway would damage the aircraft. Accordingly, "the afterburner was not to be set with the engine nacelles in the vertical. Forward speed was to be built up. I used a solution similar to that used by the British with the [Hawker Siddeley] Kestrel; engines set at 75°, then accelerate with full thrust. The runway could only sustain the heat of the afterburner for about 6sec, the thrust nozzles being less than a metre away from the ground." This was a significant difference from the X1, which had no afterburner and therefore lower exhaust-gas temperatures and shorter engine nacelles.

Transition from hovering to normal flight occurred at a height of approximately 20ft (6m). Meister explains: "If you got it right, it was possible to swivel the engine nozzles at speed setting No 2 in such a way that one could go through the whole transition with full thrust". The speed setting refers to the rotation speed of the engine nacelles. The throttle incorporated a small rocker lever which could be set in two positions, each marked in nacelle-rotation

degrees per second. Meister continues: "The afterburner was only used in hovering flight, and was switched off after the transition to horizontal flight had been made, the engines were in the horizontal and an airspeed of 220kt had been reached. In comparison to this, conventional aerodynamic take-offs were a piece of cake".

### HEART-THUMPING EXCITEMENT

For the landing transition the afterburners were ignited again, before the engines could be rotated to the vertical. This made fuel and speed management critical. Nils recalls:

"Three or four miles before the landing point, at about 1,500ft [450m], the afterburners were ignited; then I pointed the nose up and swivelled the engines. The complete swivelling procedure took 15–17sec. Thrust was set at approximately 80 per cent, which was adjusted automatically. Speed was reduced using aerodynamic braking by means of the engine nacelles, after which I entered the hovering flight regime." By this point the aircraft had arrived over the intended



landing point, where it touched down a few seconds later. "Noise was not a problem in the VJ101. I flew with a normal helmet, with no added padding. The aircraft vibrated quite a bit, but not so much as to make it unpleasant".

As part of the programme, extensive research was also undertaken into the physiological aspects of the test-flying regime, as Meister explains: "The medical department wanted to get as much medical data as possible from the testing phase. We were wired up for heart frequency and respiration rate on every flight. The other pilots all seemed pretty tough, and I was curious to find out how my body was dealing with the various stresses and strains.

"I sat in the aircraft on the ground and started rolling, with my heart rate at the normal 90 beats a minute, up to 110 beats a minute; the engine nacelle would rotate perpendicularly, and the moment I pushed the throttle forward my heart rate skyrocketed to 200 beats a minute! I thought I was the only one to experience so much fear, but of course we were all the same. Talking to Bright and Obermeier, it transpired that, starting from the point when they made the transition from horizontal to vertical flight — literally sitting on the nozzles — their bodies also reacted in the same way."

"There seemed to be a connection between the parameters on the aircraft and on the pilot's body. From the moment the aircraft started to fly aerodynamically, with the engines set at about 20° to the horizontal, I noticed that my pulse decreased to 100 beats a minute. From the

middle of the landing transition onwards, it shot up to about 200 again. I hadn't noticed any of this during flight, it was all very subliminal."

One flight remains particularly vivid in Meister's memory. "In the pre-flight briefing we decided to try hovering flight with up to 120kt forward speed and then land again. Initially, all went according to plan; with engine nacelles set at 75° on full power, I was in the air after 200ft [60m], and then I accelerated and accelerated and accelerated without thinking. I finally reached 120kt — way beyond the runway. We hadn't planned it like this! Then I thought, 'Well, what are you going to do now?' I maintained 120kt and made a tight aerodynamic turn for the point from which the landing transition was initiated. I was very low on fuel by the time the engines had swivelled to 90° in the base turn, so I switched them back to 75° once in the approach. After a safe landing I had a mere 200lb of fuel left, which would have lasted only a few more seconds."

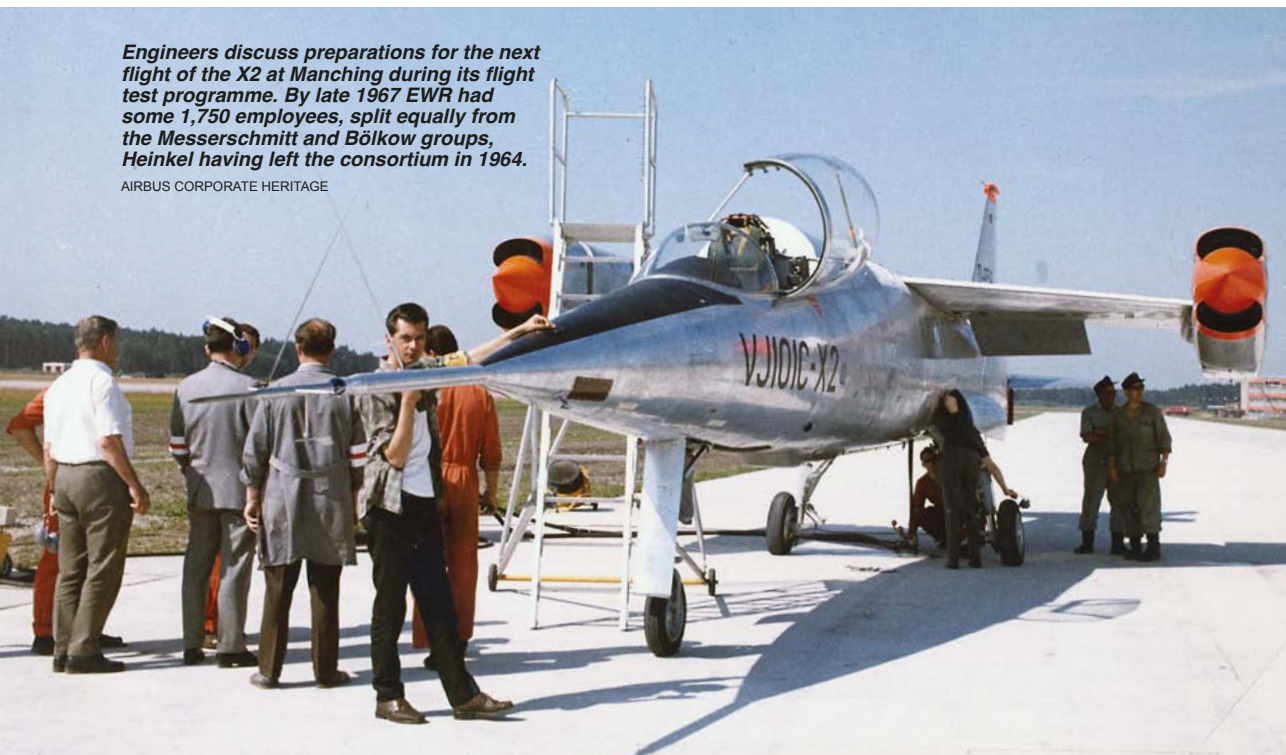
### GOING SUPERSONIC

Looking back, Meister believes that "the only truly critical flight" of the VJ101C's test programme was its all-important supersonic flight. "The X2 was capable of supersonic flight easily," he says, "although the performance of the afterburner-equipped engine had not been proven at high altitudes yet, and there were concerns about intake stall. Therefore it would not be completely without risk".

The VJ101C test programme was run to strict

**Engineers discuss preparations for the next flight of the X2 at Manching during its flight test programme. By late 1967 EWR had some 1,750 employees, split equally from the Messerschmitt and Bölkow groups, Heinkel having left the consortium in 1964.**

AIRBUS CORPORATE HERITAGE







**ABOVE** The first prototype in conventional flight before its accident in September 1964. George Bright remarked that “we based our techniques on the assumption that the flying qualities of the ‘bedstead’ and the aircraft would be the same; our only error was that the aeroplane’s flying qualities were far superior to those of the test rig!”

time and budget constraints, and there was to be only one flight to prove the type’s supersonic capability. The pressure to get it right was high, as Meister recalls:

“It was made clear that if I did not make it on that flight, then there would be no further attempts at a supersonic flight. I took off and began a climb to altitude. We wanted to start the test at 36,000ft [11,000m], but at 25,000ft [7,600m] the afterburner on the starboard lower engine went out. The test team and I considered briefly what to do. Twice I tried to re-start the afterburner and twice it refused. I was running low on fuel and time and did not want to risk re-starting the whole starboard lower engine.

“At 36,000ft we decided that if I put the aircraft into a gentle dive, it would go supersonic. By the time they finished talking about it on the ground, I was already diving, with both chase

aircraft clocking Mach 1.08, and the VJ101 recording Mach 1.13. We were all supersonic.

“I had very little fuel left, and, realising that I had sufficient thrust to fly aerodynamically on two engines, I switched off the lower engine on the other side. I came in to land 10kt faster than usual, at about 220kt. I was a little low and pushed the throttle forward for a short burst of power. The nose immediately dipped! I sat there with the stick pushed hard into my belly and still the nose did not come up. On short finals I pulled back on the throttle, and the nose began to rise. It was a relatively hard touchdown with the stick fully back.”

What nobody had thought of was the consequence of shutting down both lower engines, which quickly became clear after some reflection, as Meister explains: “The aircraft had four [nacelle] engines; the lower two were switched

**In 1967 the X2 suffered a hard landing after ingesting hot engine gases while taking off from a raised platform. It was heavily damaged but was rebuilt to flying condition, and was finally retired in the second half of 1971.**

ALEX STARUSZKIEWICZ







**ABOVE** The second VJ101C is now a permanent exhibit at the excellent Deutsches Museum in Munich. Some 115 foreign companies participated in the VJ101C project, 35 of which were British (including Dowty-Rotol, Dunlop, Martin-Baker and Lucas), 60 of which were American and 20 were French, to the tune of more than DM62,000,000.

off and the upper two were kept running. Thus the pitching moment during my thrust-increase input forced the aircraft's nose downward. Nevertheless, we had done it — we had made a confirmed supersonic flight with the VJ101."

### PROJECT CANCELLED

Although the X2 recorded only 14.2hr of flying time over some seven years of testing, the sum of its achievements is nevertheless impressive. In total, 325 tests were completed, including 45 hovering flights (38 with afterburner), nine transitions for take-off and landing as well as 22 aerodynamic flights, all of which yielded invaluable information far in advance of other contemporary projects. Indeed, it has taken more than 40 years for another supersonic VTOL aircraft to be developed, in the form of the USA's Lockheed Martin F-35, more accurately a STOVL (short take-off and vertical landing) aircraft.

While it is true to say that all of West Germany's ambitious VTOL aircraft projects of the 1960s represented technological milestones, it is also clear that they would never have been able to fulfil the requirements of a front-line military aircraft, especially given how requirements have changed over time, as Gero Madelung points out:

"Germany's commitment to Nato is now built around the task of interdiction — attacking the enemy air force at its own airfields. This is a "lo-lo-lo" mission that requires a range of approximately 250 miles. The VJ101 was not designed for such a mission. In addition, the requirements for payload increased, which would have been impossible for a VTOL aircraft. Enter the Panavia Tornado".

Nils Meister agrees: "Everyone knew that the VJ101 would not be able to carry a payload.

### EWR VJ101C data

#### Powerplant

**VJ101C X1** 6 x 2,750lb-static thrust Rolls-Royce RB.145 turbojet engines

**VJ101C X2** 6 x 3,650lb-static thrust Rolls-Royce/MAN RB.145 turbojet engines with afterburner

#### Dimensions

Span	6.61m	(21ft 8in)
Length	15.7m	(51ft 6in)
Height	4.1m	(13ft 6in)
Wing area	18.6m <sup>2</sup>	(200ft <sup>2</sup> )

#### Weights

Maximum take-off	8,000kg	(17,640lb)
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#### Performance

Max speed	
proposed	Mach 2+
achieved	Mach 1.13

We could fly aerodynamically for half an hour, maybe a little longer. To carry bombs on the VJ101, however, was unthinkable. Also, we would have needed a range of 1.5hr, or at least 40min one-way, if we were going to reach significant targets."

The point of the VJ101 project had intentionally been one of technological progress, and the re-establishment of West Germany's reputation as a world-class industrial nation. "We were just glad to be back in the combat aircraft business", says Meister. On a political and technological level the VJ101 had secured West Germany a place at the international table, an invaluable legacy which would later pay dividends well into the era of the Tornado and today's impressive Eurofighter Typhoon.





# Folland's Forgotten Monoplanes

Henry Folland is often considered the ultimate biplane designer, resistant to exploring monoplane designs. But was he? Using newly-discovered material from the Royal Aero Club Trust archives, **RALPH PEGRAM** takes a detailed look at Folland's little-known civil monoplane designs of the 1930s and re-evaluates his reputation as a biplane specialist

**I**N THE YEARS immediately before the Second World War, unrealised projects and concept designs by major British aircraft constructors typically outnumbered the types they actually built by a substantial margin. While many of these projects were conventional designs, a number introduced interesting ideas that were either deemed to present too great a technical risk or otherwise failed to measure up to expectations at the time. When these latter projects are taken into consideration alongside the types constructed, it offers a more complete insight into the thought processes and capabilities of the company's designer; a view that often runs counter to the general perception. And so it was for Henry Philip Folland.

Folland is rightly remembered as Britain's premier designer of biplane fighters during the inter-war years, when he was responsible for a string of outstanding aircraft produced by the Royal Aircraft Factory, Nieuport & General Aircraft and latterly Gloucestershire Aircraft (renamed Gloster Aircraft in 1926). In his role as Chief Engineer and Designer at Gloster, Folland led a dynamic team of talented individuals from the time of his move to the company in 1921 until his resignation in early 1937.

He is dismissed too often as a man wedded to biplanes, reluctant to adopt new technology and, as a consequence, increasingly unable to win contracts. It is undoubtedly true that Gloster suffered more than some of its key competitors during the severe global economic downturn of

the late 1920s, yet it is too simplistic to conclude that inertia or anachronistic design lay at the heart of the problem. As we shall see, the monoplane aircraft projects developed by Henry Folland in the early 1930s were every bit the technical equals of his competitors.

## THE FIGHTER FACTORY

In late 1920 the Gloucestershire Aircraft Company (GAC), which had been formed three years earlier, acquired the designs and surplus materials of the soon-to-be-defunct Nieuport & General Aircraft Company Ltd, where Folland had served as chief designer. *[For more on Folland's pre-Gloster aircraft see Philip Jarrett's two-part Pioneering The Fighter series on Folland's innovative pre-S.E.5 aircraft for the Royal Aircraft Factory in TAH issues 3 and 5 — Ed.]* The express aim of GAC was to compete in the post-war market for fighters.

Folland and his deputy, Howard Preston, joined GAC in 1921, and to promote the company's capabilities Folland was asked to adapt his Nieuport Nighthawk fighter as a racer, so that GAC could compete in contests such as the Coupe Deutsch and the Aerial Derby and establish speed records. In this endeavour the company scored several successes, with the result that both company and designer featured prominently in the British national press.

The quality of Folland's designs was self-evident and contracts for fighters were soon to follow, both in Britain and overseas; and his family of single-seaters underwent continual structural



PHILIP JARRETT COLLECTION

*Henry Folland was born in Cambridge on January 22, 1889. After working with the Lanchester Motor Co and Daimler, he joined the Royal Aircraft Factory at Farnborough in 1912, where he established a reputation as a designer of highly advanced aircraft.*



and aerodynamic improvement throughout the 1920s, including a seamless transition from wood to metal-framed construction achieved through the acquisition of the Steel Wing Company.

From 1924 GAC's management decided to construct seaplanes to compete for the prestigious Schneider Trophy and although the company suffered unfortunate failures on several occasions and only managed to finish the contest once (taking second place in 1925), Folland's aircraft were competitive and well regarded. Early in 1928 Folland commenced work on the Gloster VI, an advanced racer intended to compete for the Schneider Trophy contest in 1929.

In common with many of his competitors Folland was well aware that recent advances in aerodynamics and structural design had reached a point at which monoplanes would prove superior to biplanes in many roles, including racing. Yet the conventional narrative, written long after the event, says that Folland was reluctant to step away from his proven biplane formula and did so only when it was found impossible to adapt his Gloster V biplane design to accept a supercharged Napier Lion VIID engine, as the spars of the upper wing were impeded by the position of the engine's cylinder blocks. This wing relocation problem was inevitable; the Gloster V had been conceived as a quick and cheap modification of the 1927 Gloster IVB racer design, and was originally to be powered by the much lighter Lion VIIC, itself just a simple modification of the 1927 engine. This low-cost approach had been adopted simply to enable Britain to participate in the 1928 contest after Air Ministry funding had been withdrawn. However, Folland had been working

in parallel on a completely new racer, the Gloster VI, tailored specifically to take Napier's projected supercharged Lion VIID, in the expectation that the contest would be rescheduled for 1929 and that the Air Ministry would reverse its decision and provide financial and technical support. Both expectations proved to be correct.

### **GLOSTER'S FIRST MONOPLANE**

The Gloster VI introduced two firsts for Folland and Gloster; it was their first monoplane and their first aircraft with a Duralumin semi-monocoque fuselage. Supermarine's S.5, which had won the Schneider Trophy in 1927, had been constructed in this way and had proven marginally faster than Folland's Gloster IVB — and easier to fly, as visibility for the pilot was superior. Folland took full advantage of access to the government's facilities at the National Physical Laboratory (NPL) and Royal Aircraft Establishment (RAE) to hone the key elements of the aircraft; these would be its aerodynamics, hydrodynamics and radiator efficiency, Folland continuing the research programme that had begun in early 1926.

The Gloster VI's elegant Duralumin fuselage was a minor masterpiece of minimal frontal area and aerodynamic refinement, shaped tightly around engine and pilot, while the monoplane wing was constructed of wood and employed the multi-spar cellular structure that Folland had developed for his earlier racer. Far from being a late change forced upon a reluctant Folland, the wing was in fact a sophisticated design for its time, featuring spanwise changes in both aerofoil section and chord in order to minimise interference drag with the fuselage and to avoid

*Folland's first design for the Gloucestershire Aircraft Company was the Mars I, given the nickname "Bamel". The aircraft's streamlined appearance was evidence of the designer's ethos to reduce head resistance as much as possible. On December 19, 1921, the Bamel set a British speed record of 196.4 m.p.h. TAH ARCHIVE*





**ABOVE** The exceptionally aerodynamically clean Gloster VI, Folland's first monoplane design. A contemporary newspaper remarked that "it seems more the conception of an artist who can create with the stroke of a brush than the work of a designer who is bound by engineering principles and the inelasticity of timber and metal".

harsh stall characteristics, a common problem with high-speed racers in tight turns, that had resulted in the death of several pilots.

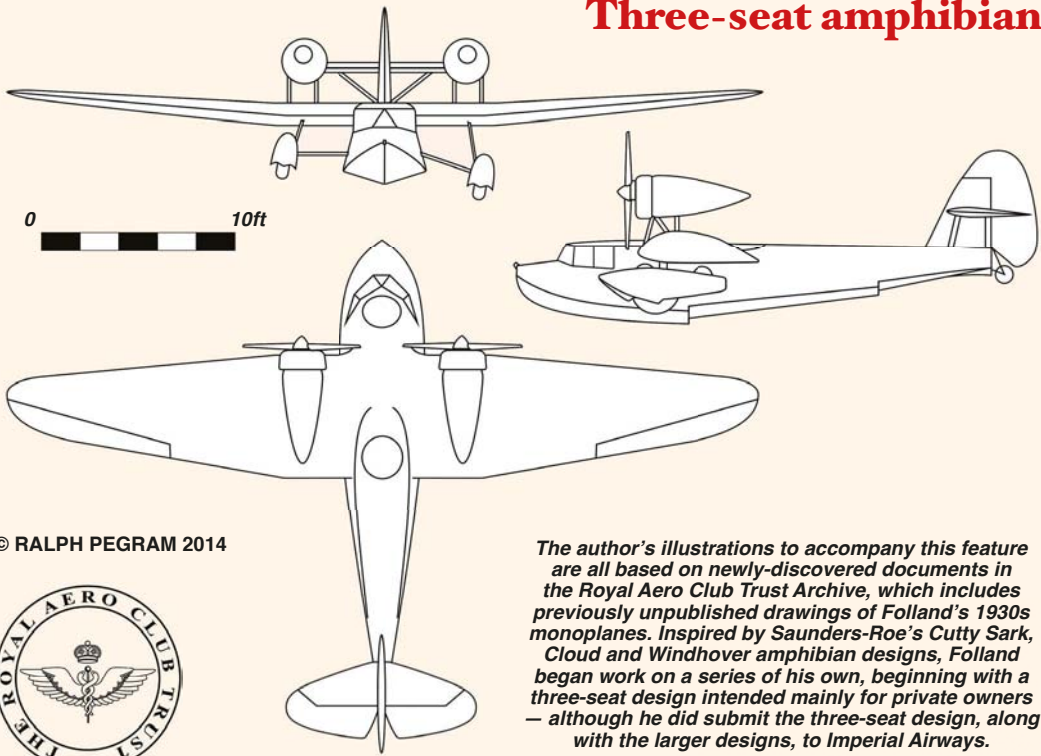
The Duralumin floats, too, were highly refined in shape with an excellent balance between drag in the air and stability on the water. Folland's design team for the aircraft included a number of famous names. Howard Preston, Folland's long-term deputy, was a key member alongside engineer George Dowty, later of undercarriage fame; there was also Frank Duncanson, an aerodynamics specialist who had been deputy designer at Fairey, where he led the team that designed the Flycatcher; and William Munro, an expert in hydrodynamic design who would later go on to be the lead designer for the Supermarine Walrus. There was a wealth of talent on tap and the results were plain to see.

Unfortunately Napier suffered serious delays in the development of the Lion VIID's supercharger and the first engines were delivered to Gloster just days before the contest, leaving little time to test the aircraft. On the very first flight it became apparent that there were unexpected problems with the induction system that resulted in abrupt cut-outs and power surges. When it

proved impossible to cure these in the few days remaining, the Gloster VI had to be withdrawn from the contest. After feverish work the Gloster and Napier teams were able to achieve a measure of reliability sufficient to allow the aircraft to make an attempt on the air speed record, which it took at an average of 336 m.p.h. (540km/h) over four runs on September 10, 1929. This was below its design speed, the flight having been hampered by the engine running below maximum power. Napier and Gloster were despondent, a mood which worsened when Supermarine's S.6 raised the record to 357 m.p.h. (575km/h) just one day later.

The Gloster VI was an excellent aircraft; a fine first monoplane for Folland, praised by the few pilots who had the opportunity to fly it, but the Lion VIID installation was fatally flawed and the engine could never be coaxed to run cleanly for extended periods. Abrupt power surges, in-flight failures and excessive vibrations were common. The engine itself was of sound design, as subsequent water- and land-speed records testified, but the compact packaging of the supercharger, carburetors and ducting placed the air intakes in poor locations on the airframe, which resulted in variable airflow and pressure

## Three-seat amphibian



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*The author's illustrations to accompany this feature are all based on newly-discovered documents in the Royal Aero Club Trust Archive, which includes previously unpublished drawings of Folland's 1930s monoplanes. Inspired by Saunders-Roe's Cutty Sark, Cloud and Windhover amphibian designs, Folland began work on a series of his own, beginning with a three-seat design intended mainly for private owners – although he did submit the three-seat design, along with the larger designs, to Imperial Airways.*

effects, especially in turns, leading to an unstable fuel mixture to the supercharger, which was also prone to surging and water ingestion.

### FOLLAND'S AMPHIBIANS

From this point Folland's work splits down two distinct paths; one produced a series of classic Gloster biplanes, notably fighters, and the other resulted in a number of project designs, many of which were for monoplanes, that failed to win contracts and are now largely forgotten. Britain's aircraft constructors entered a period of hardship as the 1920s drew to a close and the Wall Street Crash in the autumn of 1929 triggered a global recession. As a result, government spending on military projects was significantly scaled back, with commercial aviation suffering cuts in funding too. Those companies with production contracts in their pockets or with financially robust owners tended to be able to weather the storm, while those without faced a bleak future.

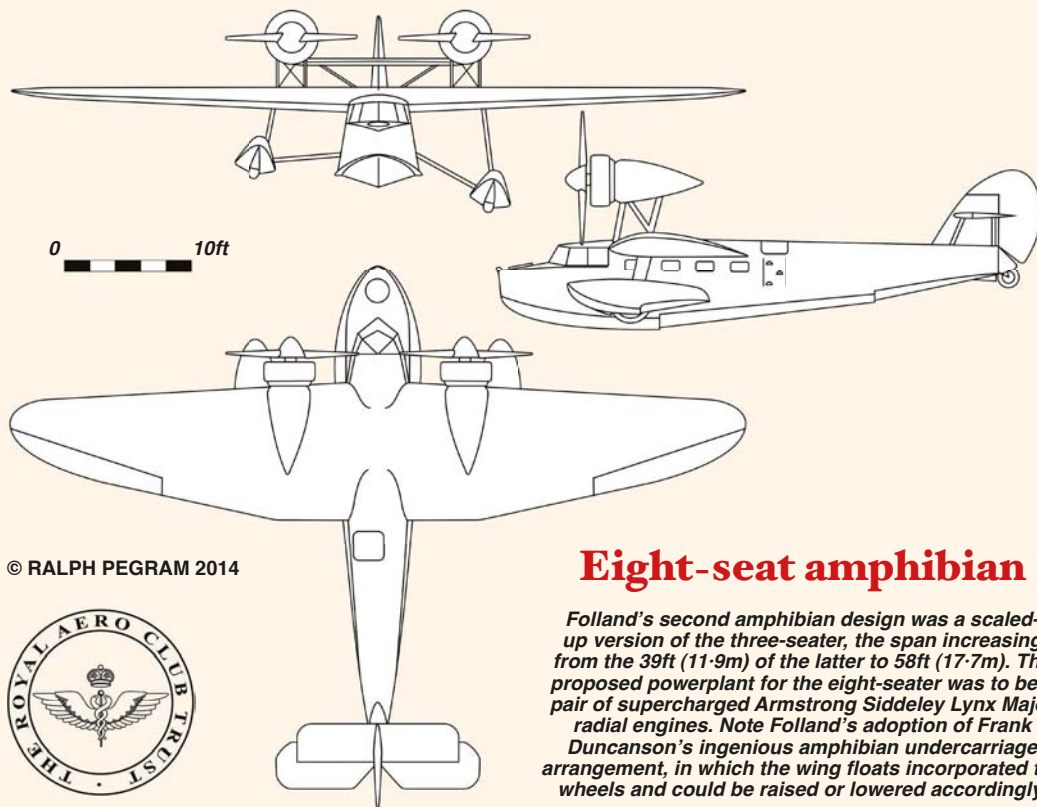
Gloster was very much in the latter category; the company had failed to win contracts for its Goldfinch fighter tendered to specification F.9/26, the Gnatsnapper to N.21/26 or for the SS.18 multi-gun fighter to F.20/27. Other one-off prototypes, including the TC.33 biplane bomber transport and TSR.38 torpedo bomber, added to the drain. Building Siskin IIIs under contract to

Armstrong Whitworth and wings for the Westland Wapiti mitigated the problem to some extent, but the financial strain of building a sequence of prototypes rapidly took its toll and heavy staff cuts followed. Large parts of the works were let for storage or other purposes, while many of the remaining workforce undertook more menial metalworking tasks on non-aviation projects.

A proposed merger with Napier, which was also suffering badly, failed to go ahead. Folland doggedly pushed onward with the development of the SS.18 fighter, successive modifications and engine changes resulting in the SS.19, 19A and 19B until Gloster finally received a contract for a production version, the Gauntlet, in 1934. Meanwhile Folland was making every effort to enter new markets with monoplane designs, and looked to Imperial Airways and its requirement for small freight and passenger carriers.

In the summer of 1929 Saunders-Roe, based on the Isle of Wight, introduced the Cutty Sark, a two-seat twin-engined amphibian flying-boat aimed at the private flyer. This featured a simple flat-sided metal hull with corrugated skins and a shoulder-mounted cantilever wooden monoplane wing based on Fokker patents. In 1930 the basic design was scaled up to produce the eight-passenger Saro Cloud and the three-engined Windhover. These represented a new





## Eight-seat amphibian

*Folland's second amphibian design was a scaled-up version of the three-seater, the span increasing from the 39ft (11.9m) of the latter to 58ft (17.7m). The proposed powerplant for the eight-seater was to be a pair of supercharged Armstrong Siddeley Lynx Major radial engines. Note Folland's adoption of Frank Duncanson's ingenious amphibian undercarriage arrangement, in which the wing floats incorporated the wheels and could be raised or lowered accordingly.*

class of aircraft in Britain and attracted a great deal of interest.

After viewing the Cutty Sark, which Saunders-Roe had cheekily flown around Calshot during the press days for the 1929 Schneider Trophy contest, Folland rather surprisingly decided that Gloster should attempt to enter the commercial amphibian market. Although it had built a number of seaplanes and had the expertise to construct Duralumin floats, the company had no experience with flying-boats or amphibians. At that time Britain had at least four companies building such aircraft; Saunders-Roe, Supermarine, Short Bros and Blackburn, so it was a brave move to enter

what was already a highly competitive market.

In January 1930 the design department drew up a family of three amphibians, all following the basic pattern of the Cutty Sark. Three twin-engined designs were put forward: a three-seater, an eight-seater and a large version capable of carrying a total of 14. The proposed undercarriage was novel, the mainwheels being located in the bottom of the twin wing floats, a variation of a method patented by Duncanson during his tenure at Fairey. The floats could be raised or lowered by near-vertical struts from the wing and pivoted on lateral struts attached to a hinge on the hull sides.

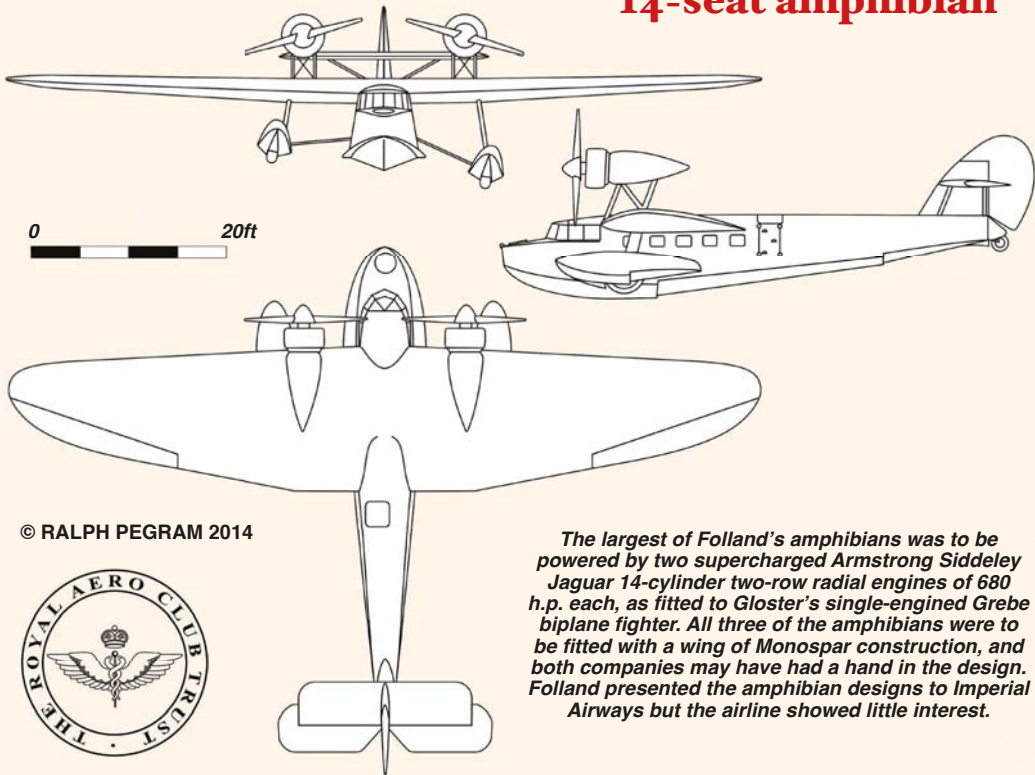
The metal hulls were simple flat-sided designs

***The Saunders-Roe Cloud was one of the inspirations for Folland to begin design work on a series of amphibians in 1930. This example, K2681, was fitted with a Monospar wing and is seen here at an RAF pageant at Hendon.***

PHILIP JARRETT COLLECTION



## 14-seat amphibian



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*The largest of Folland's amphibians was to be powered by two supercharged Armstrong Siddeley Jaguar 14-cylinder two-row radial engines of 680 h.p. each, as fitted to Gloster's single-engined Grebe biplane fighter. All three of the amphibians were to be fitted with a wing of Monospar construction, and both companies may have had a hand in the design. Folland presented the amphibian designs to Imperial Airways but the airline showed little interest.*

## Folland's amphibian monoplanes data

	3-seater	8-seater	14-seater
<b>Powerplant</b>	2 x Pobjoy radial engines	2 x Armstrong Siddeley Lynx Major radial engines	2 x Armstrong Siddeley Jaguar radial engines
<b>Dimensions</b>			
Span	39ft 0in (11.89m)	58ft 0in (17.68m)	76ft 0in (23.16m)
Length	26ft 6in (8m)	42ft 0in (12.8m)	53ft 0in (16.15m)
Height	8ft 6in (2.6m)	15ft 0in (4.6m)	17ft 6in (5.3m)
Wing area	88ft <sup>2</sup> (8.18m <sup>2</sup> )	505ft <sup>2</sup> (46.9m <sup>2</sup> )	870ft <sup>2</sup> (80.82m <sup>2</sup> )
Tailplane			
and elevator area	25ft <sup>2</sup> (2.32m <sup>2</sup> )	67ft <sup>2</sup> (6.22m <sup>2</sup> )	128ft <sup>2</sup> (11.89m <sup>2</sup> )
Fin and rudder area	12.5ft <sup>2</sup> (1.16m <sup>2</sup> )	35ft <sup>2</sup> (3.25m <sup>2</sup> )	64ft <sup>2</sup> (5.95m <sup>2</sup> )
Cross-sectional area of hull	11.5ft <sup>2</sup> (1.07m <sup>2</sup> )	34ft <sup>2</sup> (3.16m <sup>2</sup> )	43ft <sup>2</sup> (3.99m <sup>2</sup> )
Cross-sectional area of wing floats (total)	3.4ft <sup>2</sup> (0.315m <sup>2</sup> )	11ft <sup>2</sup> (1.02m <sup>2</sup> )	14ft <sup>2</sup> (1.3m <sup>2</sup> )
<b>Weights</b>			
Empty	1,170lb (531kg)	4,078lb (1,850kg)	6,870lb (3,116kg)
Equipment (radio etc)	—	400lb (181kg)	400lb (181kg)
Crew, passengers and luggage	540lb (245kg)	1,680lb (762kg)	3,000lb (1,361kg)
Fuel and oil	290lb (132kg)	942lb (427kg)	1,930lb (875kg)
Total weight	2,000lb (907kg)	7,100lb (3,220kg)	12,200lb (5,534kg)
Fuel capacity	33gal (150lit)	110gal (500lit)	223gal (1,014lit)
Oil capacity	4gal (18lit)	9.5gal (43lit)	20gal (91lit)



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**ABOVE** The author's three-dimensional rendering of Folland's 14-seat amphibian design, bearing the spurious registration G-AEGZ, which was allocated to a British licence-built Sikorsky S.42 but was never taken up. The name City of Gloucester beneath the cockpit is also bogus, but in line with Imperial Airways policy of the time.

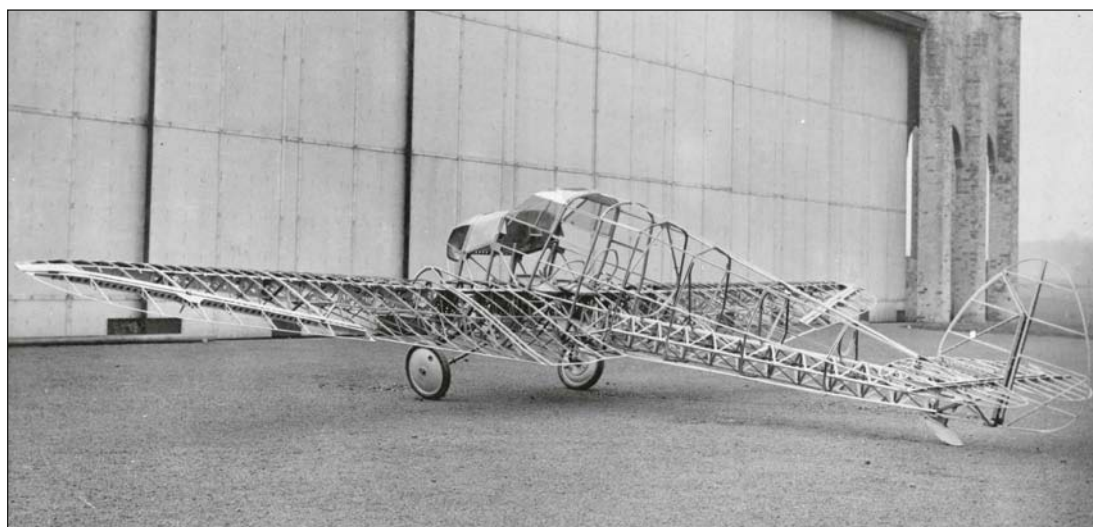
with a simplified planing bottom that minimised curvature of the plates, a method patented by Saunders-Roe in 1929 but never actually used on its own aircraft. The cantilever metal wings were of "monospar" design.

The Monospar Company Ltd was established in 1929 to exploit a metal cantilever wing-construction system devised and patented by Helmuth J. Stieger in 1927. The wing structure was built around a single spar with the torsion and drag loads absorbed by an internal pyramidal arrangement of compression struts and tension wires, and was expected to prove considerably lighter than more conventional structures.

In late 1929 the company negotiated a contract with Gloster to build the first Monospar design, the ST-3, which made its maiden flight in late 1930 and proved the monospar concept to be

sound and to meet all expectations. Gloster also won a contract from the Air Ministry to build a large version of a monospar wing to be fitted to the latter's Fokker F.VII/3m in order to perform comparative tests against the standard wing. The flight tests, performed in 1931, were entirely successful, proving the monospar to be some 530lb (240kg) lighter than the standard Fokker wing of the same span and area.

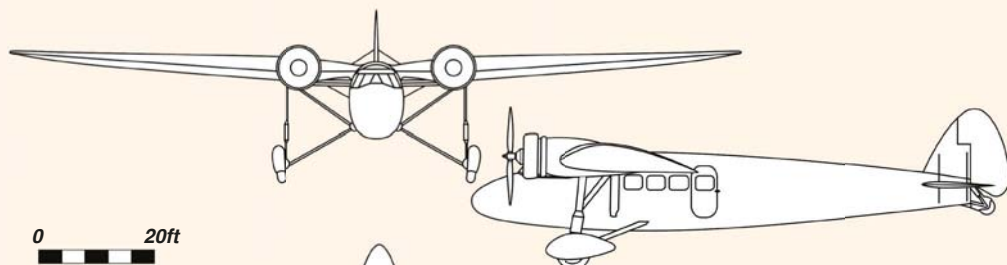
There is a strong possibility that the amphibian aircraft were a joint design effort between Monospar and Gloster; the three-seater was very similar in size to the ST-3 and was to be powered by Pobjoy engines, which powered later Monospars, while the wings of the larger commercial aircraft appear to be based on the experimental wing built for the Air Ministry. Folland submitted the three designs to Imperial Airways on a speculative



PHILIP JARRETT COLLECTION

**ABOVE** The ST-3, seen here in skeletal form, was the first complete aircraft to take the Monospar wing and was built by Gloster at Brockworth. Danish-born Helmuth Stieger's concept was to use a simple Warren-braced form of girder to create a mainspar that would resist bending and torsion by means of a system of lightweight bracing.



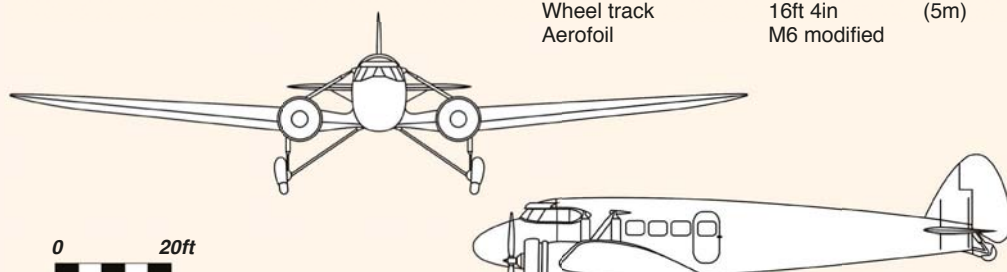


0 20ft

## Charter airliner (high-wing)

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Span	64ft 0in	(19.5m)
Length	47ft 0in	(14.3m)
Height	12ft 4in	(3.75m)
Maximum chord	12ft 6in	(3.8m)
Dihedral	3° 30'	
Angle of incidence	3° 30'	
Wing area	592ft <sup>2</sup>	(55m <sup>2</sup> )
Aspect ratio	6:1	
Aileron area	2 x 29ft <sup>2</sup>	(2 x 2.7m <sup>2</sup> )
Tailplane & elevator area	71.3ft <sup>2</sup>	(6.6m <sup>2</sup> )
Fin & rudder area	35ft <sup>2</sup>	(3.25m <sup>2</sup> )
Wheel track	16ft 4in	(5m)
Aerofoil	M6 modified	



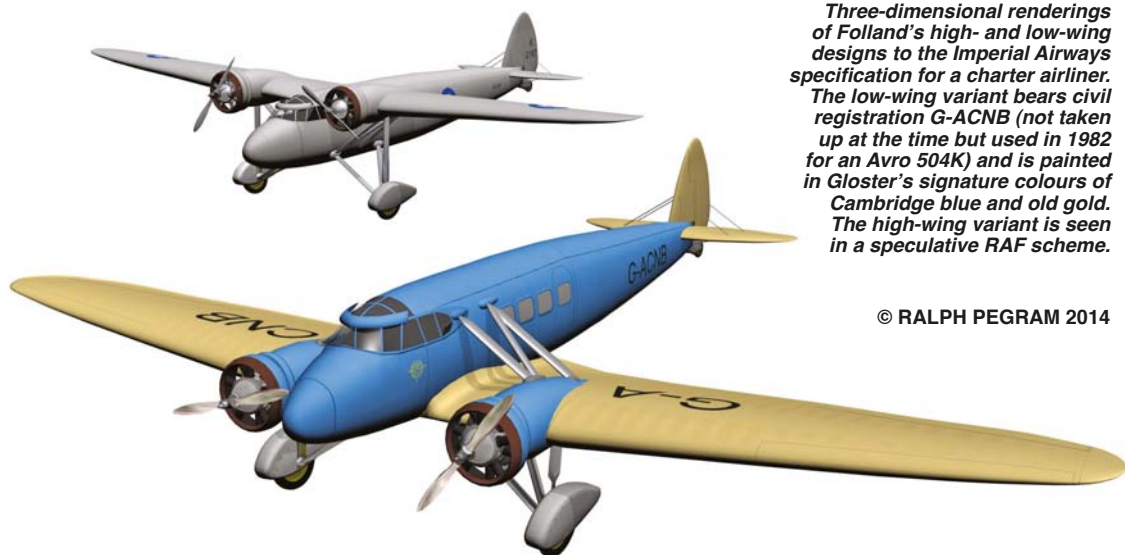
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## (low-wing)

[www.royalaeroclubcollection.org](http://www.royalaeroclubcollection.org)



*In response to a specification issued by Imperial Airways in 1931, Folland submitted a pair of monoplane designs for a four-to-five-passenger charter airliner, one of high-wing configuration and one with a low wing. Both were intended to be powered by a pair of Armstrong Siddeley Serval engines (initially known as the Double Mongoose), capable of 340 h.p. at 2,000 r.p.m. at sea level. The designs were to be Folland's last attempts at passenger-carrying aircraft, although he was concurrently working on a high-speed mailplane, which will be covered in a future TAH article.*



*Three-dimensional renderings of Folland's high- and low-wing designs to the Imperial Airways specification for a charter airliner. The low-wing variant bears civil registration G-ACNB (not taken up at the time but used in 1982 for an Avro 504K) and is painted in Gloster's signature colours of Cambridge blue and old gold. The high-wing variant is seen in a speculative RAF scheme.*

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basis, but no orders were forthcoming, and it is not known whether any of the aircraft were offered to other prospective clients. It probably came as no great surprise to Folland that he received no orders — after all, the designs featured untried technology and Gloster had no track-record in building flying-boats. It transpired to be no great loss as Saunders-Roe sold only 12 Cutty Sarks and 21 Clouds, indicating that the market was simply too small to support two manufacturers anyway.

Gloster did not utilise the monospar method in any of its later designs and instead developed its own system, as will be related in future *TAH* articles. Stieger and his partners launched a new company, General Aircraft Ltd, in 1931, in order to manufacture their own aircraft designs. The company achieved a reasonable measure of success before the company was merged with Blackburn after the Second World War.

### THE COMMERCIAL ANGLE

Folland continued to monitor the commercial aircraft market and in May 1931 signed off the drawings for two versions of a four- to five-passenger charter airliner designed in response to a specification issued by Imperial Airways. Both aircraft were monoplanes with the wings strut-braced to the elliptical-section Duralumin fuselage. One version featured a high wing, the other a low wing. Both had a fixed, faired undercarriage and were to be powered by a pair of Armstrong Siddeley Double Mongoose (Serval) engines enclosed in Townend rings.

The position of the bracing struts suggests that the wings were to be constructed with twin spars and were to be fitted with leading-edge slats. Inboard of the engine nacelles the parallel-chord section of the wings thinned markedly towards the roots in order to reduce interference, and a small auxiliary aerofoil surface was mounted along the

top of the windscreen, presumably to smooth the airflow. It is curious that these measures designed to reduce drag were negated by the use of bracing struts for the wings, wire bracing for the tailplane and a fixed undercarriage. The proposed maximum speed of both designs was to be around 150 m.p.h. (240km/h) and range at a cruising speed of 125 m.p.h. (200km/h) was to be between 370 and 480 miles (595–770km), depending on load.

Once again no orders were received and, indeed, no aircraft of comparable capacity or similar performance entered service with Imperial Airways in the short term, suggesting that the requirement may have been withdrawn. However a broadly similar specification was issued in 1933 and met by the Boulton & Paul P.71A and Avro 652 (the basis of the Anson), with two of each being ordered. No further passenger aircraft designs were submitted to Imperial Airways by Gloster and no other new civil aircraft projects for the private market are known.

Two significant events regarding design department personnel occurred in 1931. A management error arising from a request by George Dowty for a quote to manufacture his patented internally-sprung wheels led to him leaving in May to establish his own company.

On a more positive note, an agreement between de Havilland and Gloster was struck whereby Gloster would take over development of three of de Havilland's military projects. This saw the arrival of George Carter, a freelance aircraft designer, to join the Gloster team.



**NEXT TIME** — The author continues his examination of Henry Folland's reputation as a biplane specialist with details of the designer's little-known 1930s work on monoplane mailplanes, bombers and fighters, based on documents from the Royal Aero Club Trust Archive

# NON-SKEDS!

## The Story of America's Supplemental Airlines



Award-winning American civil aviation historian **DAVID H. STRINGER** opens a new two-part series on the USA's post-war non-scheduled airlines — or “non-skeds” — with the story of how the unique conditions prevailing in America after World War Two led to their formation; and how the Civil Aeronautics Board struggled to cope with the headache of regulating what it considered “fly-by-night” operators

**A**T THE END of World War Two, thousands of American veterans flocked home to start their post-war lives of peace and prosperity. Many of these former GIs were now pilots, courtesy of the government-sponsored training programmes that had minted enough aviators to manage the needs of the wartime military. A lot of these flyers now wanted to use their piloting skills to earn a living back home as civilians.

The USA's scheduled, or “certificated”, airlines absorbed large numbers of these flyboys into their ranks as aircraft were returned from the military to commercial service, as larger post-war four-engined aircraft were being delivered and as the new government-sanctioned feeder carriers were being established. [See the author's comprehensive two-part series on America's Local Service Carriers in TAH issues 3 and 4 — Ed.]

The certificated airlines were under the strict guidance of the Civil Aeronautics Board (CAB), the government agency created in 1938 to regulate commercial air traffic in the USA. No certificated carrier could inaugurate service over a new route, terminate service at an unproductive station or charge a lower fare than other airlines without permission from the CAB.

*One of the few that prospered; while most of the large irregular carriers — or “non-skeds” — relied on secondhand aircraft and failed to survive the Civil Aeronautics Board's scrutiny, some fought back and thrived. Some even managed to acquire modern equipment in the 1950s, including Irving E. Herman's Great Lakes Airlines, which operated Douglas DC-6A N6575C, seen here at Oakland, California.*

BOB RUSSO COLLECTION









**LEFT** Large irregular carriers proliferated during the late 1940s, one such example being the Reverend Chris Bachman's 20th Century Airlines, based in Charlotte, North Carolina, which operated a fleet of DC-3s, one of which is seen here operating a charter flight to Miami in 1947.

**BELOW** Success for the non-skeds often depended on military contracts. This California Eastern Airways Douglas DC-4, N37474, photographed at Oakland in 1955, proudly declares its commitment to the US Navy.

The Board's control of the routes flown and rates charged by the certificated airlines was ironclad, but the benefits to the carriers under the CAB's regulation were bountiful.

First, the Board controlled competition so that there would not be a glut of available seats on one route and a paucity on another. Secondly, certificated carriers were bestowed with the blessing of the government to carry airmail, which was a steady source of income often accompanied by subsidy for serving smaller cities whose traffic was insufficient to pay for the service provided. But what about the pilots who could not be absorbed into the ranks of the nation's certificated airlines? There were far more skilled pilots seeking jobs than there were airline positions available.

### **Birth of the "non-skeds"**

In America the entrepreneurial spirit is always alive. If there is a loophole in the law it will be found, and if there is a way of doing business that skirts regulations, it will be taken advantage

of. The CAB bestowed each of the regulated air carriers with a Certificate of Public Convenience & Necessity, a prized credential which insured the company's place in America's scheduled airline network. But when the Board laid down the rules for issuing these certificates, it wisely realized that there was also a need for additional air carriers, companies with limited operations that would have more flexibility to fill the gaps left by the certificated airlines. The Board's vision in this regard was of fixed-base operators (FBOs) and small companies with one or two light aircraft which could offer charter or occasional services in markets not reached by the certificated carriers. The CAB would grant exemptions to companies whose role it was to offer these irregular, infrequent services. Thus, a loophole was born.

To quote the Board's own report: "New conditions created by World War Two included post-war availability of surplus aircraft at distress prices or very low rentals, a large body of air-minded, trained personnel and a rising

WILLIAM T. LARKINS VIA THE OAKLAND AVIATION MUSEUM





*Sourdough Air Transport Curtiss C-46F (c/n 441) N95451 at Oakland in the 1950s. The term "sour dough" referred to prospectors who made their way to Alaska and the Yukon seeking their fortune, the appropriately-named airline operating primarily from its base in Seattle and airfields in Alaska.*

WILLIAM T. LARKINS



demand for air transport services with which the certificated airlines were not yet able to keep pace". The circumstances were ripe for ambitious entrepreneurs.

To continue the Board's assessment:

"Numerous new operators of large equipment sprang into being and registered under the old regulation exempting carriers engaging only in irregular, infrequent service from the certification process which the [1938 Civil Aeronautics] Act had established to safeguard the sound development of the basic air transport system". The CAB had created the loophole and now dozens of pioneers and opportunists were beginning to jump through it. The only requirement was that the service offered between airports be infrequent and irregular; in other words, non-scheduled.

The entrepreneurs chose names for their outfits that they hoped would have public appeal: North American Skylines, Viking Air Transport, California Eastern Airways and Caribbean Air Transport, to name a few. Some monikers were not particularly well thought out. After a few months of operation, the men behind Fireball Air Express rather wisely realised that the less-inflammatory Standard Air Lines would be a better name for their company.

War-surplus Douglas C-47s were plentiful and even C-54s were available in the marketplace of used military aircraft. The servicemen-turned-businessmen began to pool resources with their buddies and started snapping up these bargains. Many of the pilot-entrepreneurs felt that they could make a go of it flying cargo, while some outfitted their secondhand fleets with standard passenger seats. A few used the bucket seats or inward-facing bench-type seating that their

former military aircraft came equipped with and offered basic transport to those willing to pay.

The non-scheduled airline phenomenon attracted lots of attention among those in the field of commercial aviation and the CAB was perplexed. Here were former servicemen taking advantage of a precept that was never intended to be interpreted as a pass to start an unregulated airline, yet they were filling a need that the overburdened scheduled airlines could not meet. Customers were patronising the non-skeds, but the scheduled carriers were demanding that something be done to keep these interlopers off their turf. The CAB had been created to bring order out of chaos. Now chaos was operating alongside order.

### **Enter the Supplementals**

The CAB's first attempt to introduce some structure into the situation was to recognise the existence of this new breed of air carrier and separate it from the smaller outfits which were operating under the intent of the 1938 rule. In 1946, all companies employing large transport aircraft in irregular service were informed that they would be subjected to a safety inspection in order to obtain a letter of registration identifying them as an approved large irregular carrier. This was not the Certificate of Public Convenience & Necessity issued to the scheduled airlines, but a document verifying that the company was registered with the CAB and was in compliance with safety regulations.

The Civil Aeronautics Administration (CAA), forerunner to the FAA, initiated the carrier examinations but did not have enough inspectors to accomplish the job quickly. Meanwhile, non-skeds that were already



*Wearied C-46 N4877V of Capitol Airways, one of the lucky companies to survive the CAB's regular "shakeouts". Scheduled airline Capital Airlines bitterly opposed such a similar name, but the non-sked had begun operations while Capital was still trading as Pennsylvania Central Airlines.*

WILLIAM T. LARKINS



operating in August 1946 were allowed to continue operating until the CAA could get around to inspecting them.

The term "large irregular carriers" was certainly not a very impressive label, but that was the official designation for this group of companies, which the CAB also called non-certificated carriers or, simply, "irregulars". Of course they were also referred to as non-skeds or, pejoratively, as "fly-by-nights". It was not until the mid-1950s that the CAB finally gave this group of companies a more respectful moniker: supplemental airlines. (In this article, the terms non-skeds, non-certificated carriers, irregulars and large irregular carriers all refer to the group designated as "supplemental airlines" in 1955.)

The irregulars' operations were primarily meant to be charter flights. Aircraft were often chartered by a travel agency owned by or associated with the carriers themselves, to offer flights between designated points. The "agency" would advertise flights in local newspapers to distant destinations for prices that undercut the

scheduled airlines. While these were ostensibly charter flights, the operations looked more like scheduled services.

The CAB also allowed a highly-restricted number of seats to be offered via regular sale to the public. The Board's hope was that the problem of the non-skeds would resolve itself as they found their niche which, hopefully, would not infringe upon the business of the certificated carriers. But the operators of the irregular airlines knew where the traffic was and placed their aircraft on services from New York to the West Coast via Chicago and other major cities; New York—Miami; from the mainland USA across the Atlantic to San Juan in Puerto Rico and eventually across the Pacific to Hawaii.

The general impression was that, for much of their custom, the large irregular carriers were like airborne tramp steamers, flying around the country picking up passengers and freight wherever they could find the business. This was certainly true of their participation in the transport of seasonal workers to and from

## The USA's non-skeds — safety first?

ON AUGUST 21, 1946, Douglas DC-3 NC51878, operated by a company calling itself Trans-Luxury Airlines, crashed while attempting an emergency landing at Moline, Illinois. The pilot and copilot were killed, while several of the 24 others aboard were injured. The cause of the crash was blamed on "failure of the pilot to find out precisely what was causing an oil leak which the crew observed while on the ground at Chicago [Midway], a refuelling stop". After being told by a mechanic that the engine would have to be washed down to find the source of the leakage, the captain elected to forego the time-consuming procedure and continue on to Omaha, Nebraska, his next stop. The leak originated in a cracked cylinder which failed in flight between Chicago and Omaha. After losing the engine, the captain attempted an emergency landing in Moline, came in too high, and struck the ground during an attempted go-around. Two weeks later, on September 5, 1946, another Trans-Luxury DC-3, NC57850, crashed near Elko, Nevada. This time 21 people lost their lives.

These were just two cases of a non-sked playing hard and fast with safety issues as part of its bid for survival in a highly competitive business. Trans-Luxury filed for bankruptcy protection but continued to operate flights that had been arranged by travel agencies until the CAB issued a cease-and-desist order. Undeterred, Edward Ware Tabor, the president of Trans-Luxury, sold his interest in the company, then set up another airline to operate between New York and Puerto Rico, calling it Trans Atlantic Airways. **DHS**

Alaska each year in support of the fishing and canning industries.

Owing to the fact that they operated around the clock, generating revenue wherever and whenever they could, and because some of the financially-strapped operators often arranged their arrival and departure from airports to take place in the middle of the night when nobody would be around to collect landing fees, the unflattering sobriquet "fly-by-nights" was applied to the whole class. It implied that these were companies which might be here today but gone tomorrow.

Many of them did operate like that. But there were other companies listed among the irregular carriers that were professional, well-run organisations trying to do a good job of taking up the slack where the scheduled airlines left off. They operated with self-imposed strict rules for their employees and crews and followed good business principles, becoming well-respected enterprises admired by their customers and the public in general. Among these were Orvis M. Nelson's Transocean Air Lines, which would receive worldwide acclaim for its services, and Dr Ralph Cox's United States Overseas Airlines (USOA). It was embarrassing for these companies to be lumped into the same category as outfits that, in their quest for a buck, paid little attention to maintenance, crew competency, crew rest and aircraft loading procedures.

From the CAB's perspective, it was becoming



increasingly difficult to see the value of the large irregular carriers aside from the excess "lift" they provided to supplement the service already offered by the scheduled airlines. The certificated airlines themselves were making it quite clear that they would be happy to see the non-scheduled carriers disappear altogether.

Appearing before an audience of air transport industry officials late in 1946, CAB chairman James M. Landis spoke openly about two new classifications of air carriers that were emerging: the feeder lines, which would be evaluated, certificated, promoted and subsidised by the government, and the large irregular carriers, which were unregulated but seemed to be filling a need. Landis stated that it would cost American taxpayers about \$2m annually to support feeder service throughout the country but he felt it was worth it. Speaking of the irregulars, he warned that these companies "could not expect to have all the privileges of scheduled airlines without also shouldering their responsibilities". It was an affirmation that, in the eyes of the CAB and the rest of the industry, the non-skeds were second class and not as good as the scheduled airlines.

But the irregular carriers were on to something. Even though their safety record was not enviable and despite numerous complaints from customers about shoddy service, unfulfilled contracts and delayed or cancelled flights, the

Continued on page 88

**One of the most successful large irregular carriers was Transocean Airlines (TALOA), which at its peak boasted some 6,700 employees at 57 bases worldwide. It was the inspiration for the fictional carrier TOPAC featured in Ernest K. Gann's novel *The High and the Mighty*, made into a film starring John Wayne and a TALOA DC-4 in 1954.**

WILLIAM T. LARKINS VIA JON PROCTOR



# The USA's "large irregular carriers" in 1948

THE YEAR 1948 saw the highpoint of the era of the USA's large irregular carriers, aka "non-skeds". It was the year in which the CAB launched its investigation into the non-skeds at the request of the US Senate's Small Business Committee, which sought to determine the rightful place of those carriers in America's commercial airline industry. The infamous Goodkind Memo (see page 90) was issued in 1948, the resulting "purge" of the non-skeds beginning the following year. This list incorporates the names and operating bases of carriers known to have been active in **inter-state** charter or irregular, low-fare scheduled operations (passenger and/or cargo) using DC-3 or larger aircraft in 1948. Airlines engaged solely in **intra-state** service are not included.

**AAXICO AIRLINES (AMERICAN AIR EXPORT & IMPORT Co)** Miami, Florida

**ADMIRAL AIR SERVICE** Base unknown

**AIR AMERICA** Burbank, California

**AIR AMERICA'S AIRLINES** Burbank, CA. Umbrella company for operations by various non-skeds

**AIRBORNE TRANSPORT** Jamaica, New York

**AIR CARGO TRANSPORT** Newark, New Jersey

**AIRLINE TRANSPORT CARRIERS** Burbank, CA

**AIR SERVICES** Burbank, CA; Newark, NJ; Miami, FL

**AIR TRANSPORT ASSOCIATES** Seattle, Washington

**ALASKA AIRLINES** Anchorage, Alaska; Everett, Washington. Certificated by the CAB in 1951

**ALL AMERICAN AIRWAYS** Miami, FL. Not to be confused with local service carrier of the same name

**ALLTRANS AIRLINES** New York, NY

**AMERICAN AIR TRANSPORT** Miami, FL. Operated as "The Cloud Coach"

**AMERICAN INTERNATIONAL AIRWAYS** New York, NY. Operated Boeing 314 flying-boat, which ditched in Chesapeake Bay owing to fuel starvation

**ARCTIC-PACIFIC AIRLINES** Oakland, California; Seattle, WA

**ARGONAUT AIRWAYS** Miami, FL

**ARNOLD AIR SERVICE** Anchorage, AK

**ARROW AIRWAYS** Burbank, CA

**ASA INTERNATIONAL AIRLINES (AEROVIAS SUD AMERICANA)** Miami, FL; Los Angeles, California

**ATLANTIC, GULF & MIDLAND AIRWAYS** Little Ferry, New Jersey

**ATLANTIC NORTHERN AIRLINES** Maxton, North Carolina

**BIXBY AIRLINES** Long Beach, California

**BLATZ AIRLINES** Burbank, CA

**BRUNING AVIATION** Springfield, Massachusetts; Fort Wayne, Indiana

**CALASIA AIR TRANSPORT** Oakland, California.

Renamed **OVERSEAS NATIONAL AIRWAYS** in 1950

**CALIFORNIA AIR CHARTER** Burbank, CA

**CALIFORNIA EASTERN AIRWAYS** Washington DC; Oakland, CA; Burbank, CA

**CALIFORNIA GROWERS AIR EXPRESS** Burbank, CA

**CAPITOL AIRWAYS** Nashville, Tennessee;

Wilmington, Delaware. Not to be confused with certificated carrier Capital Airlines

**CARCO AIR SERVICE** Albuquerque, New Mexico; Las Vegas, Nevada

**CARIBBEAN AMERICAN AIRLINES** Miami, FL

**CENTRAL AMERICAN AIRWAYS** Louisville, Kentucky

**COASTAL AIRLINES** Miami, FL; Philadelphia, Pennsylvania; Portland, Oregon

**COASTAL CARGO** West Trenton, New Jersey. Operated passenger service as **COASTAL AIR COACH**

**COLUMBIA AIR CARGO** Portland, OR

**COMMERCIAL AIRWAYS** Rochester, New York

**CONNER AIR LINES** Miami, FL

**CONSOLIDATED AIR TRANSPORT** Pasco, Washington

**CONTINENTAL CHARTERS** Miami, FL. Operated Boeing 307 Stratoliner

**CURREY AIR TRANSPORT** Oakland, CA

**DILLER AIR TRANSPORT** Pittsburgh, PA

**DOLLAR AIRLINES** San Francisco, California. Owned by the Dollar family (Dollar Line Steamship Co). Renamed **SOUTH PACIFIC AIR LINES** in 1957

**EAGLE AIR FREIGHT** Santa Barbara, California

**ECONOMY AIRWAYS** Newark, NJ. Operated passenger service as **ECONOMY AIRCOACH**

**FEDERATED AIR LINES** New York, NY

**FLAMINGO AIR SERVICES** Avon Park, Florida; Teterboro, New Jersey

**FLEETWOOD AIRLINES** Brownsville, Texas; Oakland, CA

**FLYING TIGER LINE** Burbank, CA. Certificated by the CAB in 1949 for scheduled cargo services

**FREIGHT AIR** Miami Springs, Florida

**GENERAL AIRWAYS** Portland, OR

**GLOBAL AIRWAYS** Philadelphia, PA

**GLOBE FREIGHT AIRLINE** Hartford, Connecticut

**GOLDEN NORTH AIRWAYS** Fairbanks, Alaska

**GREAT LAKES AIRLINES** New York, NY; Burbank, CA

**GULF AIRWAYS** New Orleans, Louisiana

**GULF & WESTERN AIR LINES** Houston, Texas

**HARRINGTON'S AIR SERVICE** Mansfield, Ohio

**INTER-AMERICAN AIRWAYS** Miami, FL

**INTERCONTINENTAL AIRWAYS** Burbank, CA

**INTERNATIONAL AIR FREIGHT** Lantana, Florida

**ISLAND AIR FERRIES** Bohemia, New York

**JOHNSON FLYING SERVICE** Missoula, Montana

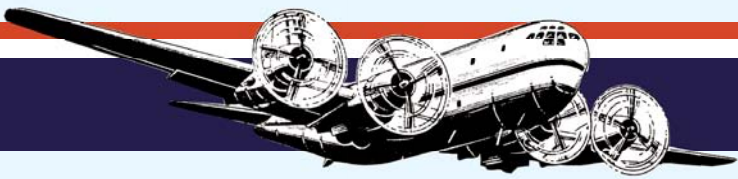
**KANSAS CITY SOUTHERN SKYWAYS** Kansas City, Missouri. Subsidiary of KCS Railroad

**LATIN AMERICAN AIRWAYS** Miami, FL

**LOS ANGELES AIR SERVICE** Burbank, CA. Renamed **TRANS INTERNATIONAL AIRLINES** in 1960

**MACKEY AIR TRANSPORT** Fort Lauderdale, Florida. Received CAB certificate in 1952. Renamed **MACKEY AIRLINES**





- McFERRIN AIR EXPRESS** St Louis, MO  
**METEOR AIR TRANSPORT** Teterboro, NJ  
**MIAMI AIR LINE** Miami, FL; Greensboro, North Carolina  
**MODERN AIR TRANSPORT** Trenton, NJ; Miami, FL  
**MONARCH AIR SERVICE** Chicago, Illinois  
**MUTUAL AVIATION** Buffalo, New York  
**NATIONWIDE AIR TRANSPORT SERVICE** Miami, FL  
**NEW ENGLAND AIR EXPRESS** Teterboro, NJ  
**NORSEMAN AIR TRANSPORT** Springfield, MA; Newark, NJ  
**NORTHERN AIRLINES** Seattle, WA  
**NORTH STAR AIRCOACH** Miami, FL  
**OCEAN AIR TRADEWAYS** Maxton, NC; Wildwood, New Jersey. Renamed **UNITED STATES OVERSEAS AIRLINES** (USOA) in 1951  
**ORTNER AIR SERVICES** Wakeman, Ohio  
**PACIFIC AIR LINES** Burbank, CA. Not to be confused with local service airline of the same name  
**PACIFIC AIR TRANSPORT** Redding, California; Santa Rosa, California  
**PACIFIC ALASKA AIR EXPRESS** Anchorage, AK  
**PAGE AIRWAYS** Rochester, New York  
**PAUL MANTZ AIR SERVICES** Burbank, CA  
**PENINSULAR AIR TRANSPORT** Miami, FL  
**QUAKER CITY AIRWAYS** Burbank, CA; Philadelphia, PA. Operated Boeing 307 Stratoliner, which crashed May 10, 1958  
**RAINIER AIR FREIGHT LINES** Seattle, WA  
**REGINA AIRLINES / REGINA AIR CARGO** Miami, FL; New York, NY. Renamed **IMPERIAL AIRLINES** in 1960  
**RESORT AIRLINES** Miami, FL. Certificated by the CAB in 1949 to operate scheduled air cruises, which were Inclusive Tour Charters (ITCs)  
**RIDDLE AIRLINES** Miami, FL. Certificated by the CAB for air cargo service to Puerto Rico in 1951. Renamed **AIRLIFT INTERNATIONAL** in 1963  
**ROBIN AIR LINES** Burbank, CA  
**ROYAL AIR SERVICE** Burbank, CA  
**SAFEGWAY SKYCOACH** Umbrella operating name for services by various non-skeds  
**SANTA FÉ SKYWAY** Wichita, Kansas. Subsidiary of the Santa Fé Railroad  
**SEABOARD & WESTERN AIRLINES** New York, NY. Certificated by the CAB in 1955 for scheduled transatlantic cargo service. Renamed **SEABOARD WORLD AIRLINES** in 1961  
**SEATTLE AIR CHARTER** Seattle, WA  
**SKYTRAIN AIRWAYS** New Orleans, LA  
**SKYWAYS INTERNATIONAL** Miami, FL; Washington DC  
**SLICK AIRWAYS** Burbank, CA; San Antonio, Texas. Certificated by the CAB in 1949 for scheduled cargo services  
**SOURDOUGH AIR TRANSPORT** Seattle, WA  
**SOUTH EAST AIRLINES** Charlotte, North Carolina; Miami, FL  
**SOUTHERN AIR TRANSPORT** Miami, FL. Purchased by the CIA in 1960  
**STANDARD AIR CARGO** Seattle, WA. Renamed **STANDARD AIRWAYS** in 1953  
**STANDARD AIR LINES** Long Beach, CA  
**STEWART AIR SERVICE** Hawthorne, California  
**STRATO FREIGHT** Hartford, CT; Albany, New York  
**SUPAIR** Concord, California; El Paso, Texas. Billed itself as "The Original Skycoach"  
**SUPER SKYCOACH** Umbrella operating name for services by various low-fare non-skeds  
**TRANSAIR** St Petersburg, Florida; New York, NY. Reservations and ticketing by the Dresser Airways Agency  
**TRANS ALASKAN AIRLINES** Anchorage, AK; Seattle, WA  
**TRANS AMERICAN AIRWAYS** Burbank, CA  
**TRANS ATLANTIC AIRWAYS** Long Beach, CA; New York, NY  
**TRANS CARIBBEAN AIRWAYS** New York, NY. Certificated by the CAB in 1957  
**TRANS-LUXURY AIRLINES** Teterboro, NJ  
**TRANSOCEAN AIR LINES** Oakland, CA. Perhaps the most famous and most respected of all of the non-skeds. Known as TAL or TALOA, Transocean's operations stretched around the globe and will be covered in detail in Part Two of this series  
**20th CENTURY AIRLINES** Charlotte, NC  
**UNITED EXPORT COMPANY** Miami, FL  
**UNIVERSAL AIRLINES** Washington DC; Miami, FL; New York, NY). Operated Boeing 314 flying-boat, which caught fire at Gibraltar in 1947  
**U.S. AIRLINES** St Petersburg, FL. Certificated by the CAB in 1949 for scheduled cargo services  
**VETERANS AIR EXPRESS COMPANY** Teterboro, NJ. Billed as "The Veteran's Airline"  
**VIKING AIR LINES** Burbank, CA  
**WATERMAN AIRLINES** Mobile, Alabama. Subsidiary of Waterman Steamship Company  
**WESTAIR TRANSPORT** Seattle, WA; San Antonio, TX  
**WILLIS AIR SERVICE** Teterboro, NJ  
**WINGED CARGO** Philadelphia, PA. Passenger division was **WINGED AMERICA**  
**WORLD AIRWAYS** Teterboro, NJ; Oakland, CA; later Atlanta, Georgia. Initially operated Boeing 314 flying-boats. The last of all the airlines once designated as supplemental airlines, World Airways ceased operations on March 27, 2014  
**WORLD WIDE AIRLINES** Anchorage, AK; Oakland, CA  
**YAKIMA SKY CHIEF** Yakima, WA; Seattle, WA

This list is based on information in John Corpening's definitive self-published book on the non-skeds, *Forgotten Flights: Non-Scheduled and Specialty Air Carriers of the United States 1945-1978*

Continued from page 85

non-skeds were proving their worth by carrying large numbers of people who did not match the demographic of the typical airline passenger of the day. They were opening up the air travel market to a new group of consumers attracted by low fares.

### Enter the “air coach”

In the mid-1940s the USA's scheduled airlines offered one class of service aboard their 21-passenger DC-3s and 40–48-passenger DC-4s. In most cases, complimentary meals were served at appropriate times and everyone enjoyed the same level of attention with no cabin divider. As the expense of air travel made flying appear to be a wealthy man's form of transport, it went without saying that the level of service provided by the regulated carriers was first class.

The non-skeds attracted customers by offering services at fares significantly below those charged by the certificated carriers. Operating aircraft outfitted with austere interiors and with few amenities to offer passengers, the irregulars borrowed a term from the railroads, which offered a less expensive alternative to first-class sleeping car accommodations in chair cars, or “coaches”. Also evoking the image of bus or motor-coach travel, usually the least expensive form of commercial passenger transport in any market, some of the non-scheduled carriers began referring to their low-priced service as “air coach” operations. The term implied a more frugal way to fly and the concept caught on.

With restrictions placed on them as to the number of flights they could operate between any pair of cities in one month, many of the non-certificated carriers banded together under the umbrella of a single agency. These



agencies were given names such as Safeway Skycoach, Super Skycoach and Air America's Airlines (not to be confused with the later Air America of CIA fame). If each of four different companies could only operate eight flights a month between two points, say Chicago and Los Angeles, then the four companies together could operate 32 flights. If only one flight operated per day with the same departure time each day, it would certainly start to resemble a regular scheduled service.

The clueless passenger would just assume that he was flying, say, Super Skycoach when his aircraft and crew were actually provided by Currey Air Transport or perhaps by Great Lakes Airlines. Cloud Coach Airlines Agency printed the last word, “Agency”, in very small letters so that the customer would think that he or she was actually flying on a carrier calling itself Cloud Coach Airlines. The air coach concept was catching on as an alternative to the certificated scheduled airlines whose fares were unaffordable for a large sector of the population.

At first the CAB and the certificated airlines appeared perplexed and mildly annoyed by this new concept. The Board nevertheless stated that the non-skeds were better suited to develop this type of service than the scheduled airlines were. But the growing popularity of the air coach phenomenon was not lost on some of those in the regulated part of the industry. With the CAB's approval, on November 1, 1948, Capital Airlines became the first certificated carrier to operate an air coach flight within the continental USA when it inaugurated its Nighthawk Service between New York and Chicago via Pittsburgh. These were “no frills” flights operating in the middle of the night with no meal service offered and only one stewardess in attendance. The

**INSET TOP** James McCauley Landis, chairman of the Civil Aeronautics Board during 1946–47. **BELOW** Slick Airways C-46 N67970 (c/n 22587) at San Francisco. Founded by Earl J. Slick in 1946, the company concentrated on cargo charters, but suffered from a poor initial safety record, which included five C-46 crashes between 1947 and 1949.

WILLIAM T. LARKINS





AUTHOR'S COLLECTION

**ABOVE** A typical example of the chicanery used by the non-skeds to increase business; several non-sked operators would band together and sell tickets through a mutually-owned agency — note how that word is used in very small type here. This ticket is not for “Cloud Coach Airlines” at all, but for Peninsular Air Transport.

aircraft employed were standard DC-4s from Capital’s fleet, which were returned to regular service during the day. The one-way Nighthawk fare between New York and Chicago, advertised as “practically rail coach fare”, was \$29.60.

The Nighthawk was an instant success and Capital Airlines was perceived as an innovative carrier that gave the public what it wanted. Other scheduled airlines slowly, often grudgingly, began to embrace the coach-class concept until the phenomenon grew over the years to become the commonplace standard of airline travel that we know today.

### Air cargo and the C-46

Among the dozens of non-skeds were several that decided to forego the problems associated with passenger transport and stick to flying freight. The transportation of cargo by air was rapidly becoming a very lucrative field.

The Santa Fé Railway saw the potential of augmenting its rail-freight service with air-freight operations and purchased several C-47s and C-54s. The company created an airline division, Santa Fé Skyway, which took its place on the list of large irregular carriers. The CAB now had to deal not only with the issue of cargo airlines among the irregulars, but also with the question of airlines being put into operation by corporations from other sectors of the transport industry. The Board eventually ruled against railroads, steamship companies and bus lines that were trying to launch airline divisions, and the Santa Fé had to abandon its airborne dreams, as did several other land- and sea-based carriers.

The post-war non-skeds that went into business with the intent of carrying goods

strictly by air were proving that such service was in demand and they were using the perfect aircraft for the job. When the government began releasing Curtiss C-46s from military service after the war, the non-skeds snapped them up.

The C-46, known as the Commando in military service, was the largest twin-engined transport in existence when it was in production and during World War Two proved itself to be a freight-hauling workhorse. As the C-47 was designated DC-3 in commercial passenger use, the C-46 could be converted to its passenger counterpart, the CW-20. However, the C-46/CW-20’s appeal as a passenger transport for the certificated airlines was negated after the war by the abundance of more suitable C-47s and C-54s available in the marketplace and by the new post-war designs coming off the production lines. But the non-certificated carriers embraced the Commando both as a cargo and as a passenger transport because they were readily available, relatively inexpensive to acquire and the scheduled airlines didn’t want them. When the USAF decided to lease some of the hundreds of C-46s that it had in storage for \$300 per month per aircraft, the majority went to non-skeds.

As the added passenger lift being provided by the irregular carriers was proving itself valuable, the fast movement of large volumes of freight by air was demonstrating another benefit offered by the non-scheduled airlines. The CAB was paying attention and was keenly interested in the possibility of a regulated air-freight service. Several of the all-cargo large irregular carriers applied for Certificates of Public Convenience & Necessity to provide scheduled air-freight services. The Board decided to take a chance and





**ABOVE** New Jersey-based Coastal Cargo operated passenger services as Coastal Air Coach; this C-46, N1683M (c/n 22476, originally built as 44-78653) served with the airline throughout the early 1950s. By 1955 it had moved to Canada, where it was registered as CF-IHU and operated by Dorval Air Transport. It ended its days in Bolivia.

issued temporary certificates to cargo carriers Slick Airways, US Air Lines and the Flying Tiger Line. These three large irregular freight airlines were accepted into the CAB's rarified world of certificated carriers in 1949 while their passenger-carrying counterparts among the non-skeds were still left on the outside, looking in.

### The Goodkind memo

While the CAB grappled with how to handle the unregulated mass of companies that made up the irregular carriers, the regulated scheduled airlines made it quite clear that they wanted the non-skeds to be put out of business. Despite the fact that the large irregular carriers were claiming that they were creating their own traffic and not infringing on the revenue stream of the regulated airlines, the scheduled carriers estimated that they lost more than \$13m in revenue to the non-skeds during 1948 alone.

In the CAB's initial attempt to bring some order to the irregulars by issuing letters of registration, 142 companies were recognised via this process. At first the Board did not define exactly what constituted "infrequent irregular" service, but eventually ruled that it meant only three flights in some markets, up to a maximum of eight in others, during any one-month period.

In 1948, at the request of the US Senate's Small Business Committee, the CAB launched a full-scale investigation into the non-skeds to determine their rightful place in America's commercial airline hierarchy. The guidelines for the investigation were written in a memorandum by Louis Goodkind, Associate Director of the CAB's Bureau of Economic Regulation. His memo was a private, internal document for the CAB staff. It was never intended for anyone's eyes outside of the CAB.

But the secret memo was made public five years later, in 1953, by investigative newspaper

columnist Drew Pearson. It was revealed that Goodkind's sole mission, outlined in the 1948 memo, was to put all of the non-scheduled airlines out of business. The vehicle for doing this would be scrutiny of each carrier by the CAB, with a planned goal of denying operating authority to every applicant. In the memo, Goodkind stated that all letters of registration would be revoked and each carrier would have to appear before the Board to apply for a regular Certificate of Public Convenience & Necessity or for permission to continue operating as a non-scheduled airline. In Goodkind's own words: "Either procedure has the advantage of affording a means for ultimately terminating the operations of this group of carriers."

The CAB's purge of the non-skeds began on April 18, 1949, when the Board summarily abolished authorisation for the irregulars and began the process of having each company apply for a certificate or for permission if they wanted to stay in business. Of the first 103 applicants to approach the CAB, 78 were turned down, only ten were approved, and the remaining carriers were left in limbo with no decision. The ten which were given a permit to function as non-scheduled operators were too small to offer any competitive threat to the scheduled airlines.

In the Board's defence, something had to be done. Aside from the fact that the CAB was frustrated by carriers ignoring their complex and restrictive operating rules, companies could not be allowed to continue in business if they routinely flouted safety regulations.

As the saying goes, one bad apple can spoil the whole barrel, and, unfortunately, there were quite a few bad apples among the non-skeds. In an attempt to keep the public from confusing any of the non-certificated carriers with the reputable scheduled airlines, back in 1946 the CAB had proposed revoking the



**ABOVE** *Modern Air Transport, also based in New Jersey, was another of the lucky carriers to survive the CAB's machinations to "rationalise" the non-skeds. By the 1970s Modern Air Transport had overcome all the obstacles thrown in the way of the non-skeds and was operating a fleet of sleek Convair CV-990A Coronado jetliners.*

letter of registration for any large irregular carrier that used the word "way" or "line" in its name, "either alone or in combination with any other term, for example airways, airlines etc". Although it appears that the ban on these terms was never enforced, many of the irregulars played it safe and avoided those two words.

### **A blessing from Berlin**

There were some bright, healthy apples among the rotten fruit, however, and just as the CAB was on the verge of putting the whole group out of business, world politics intervened and gave the more qualified non-skeds an opportunity to prove themselves. And they responded by doing a stellar job.

In response to Josef Stalin's blockade of Berlin, which cut off all land and water access to the city, British and American military personnel began supplying food, medicine and all of the other necessities of modern life to the metropolis by air from June 24, 1948. The Berlin Airlift lasted for more than a year, ending in September 1949, although the blockade was officially lifted on May 12 of that year. During the Airlift the USAF and US Navy used virtually every C-54 at their disposal, most of them from the Military Air Transport Service (MATS) fleet, to keep the continuous supply line open. The aircraft flew back-and-forth between Rhein-Main Air Base, outside Frankfurt, and Berlin, and between Wiesbaden Air Base and Berlin.

Many of the necessary supplies had to be flown across the Atlantic for positioning at Rhein-Main and, since the MATS C-54s were tied up flying the corridors to and from Berlin, the commercial airlines were called upon to fly the supplies to Europe and to take over military transport operations within the USA normally handled by MATS. The bulk of this transport power, of aircrews and aircraft, came

from the biggest available source: the non-skeds. Seaboard & Western Airlines operated 106 transatlantic flights in support of the airlift. Transocean Airlines operated 48 round-trip DC-4 missions across the ocean, the eastbound flights loaded with coal and other commodities for Berlin. Meanwhile, Slick Airways hauled supplies domestically to Westover Air Force Base in Massachusetts, where they were transferred to the overseas flights.

The non-skeds proved how valuable their services could be to the military. The need for a large amount of excess lift at short notice, without disrupting the schedules of America's certificated airline network, could be met only with the aid of the vast pool of aircraft and crew members supplied by America's non-skeds.

As a result, the military's view of the non-skeds was in stark contrast to that of the CAB, which, under pressure from the certificated scheduled airlines, wanted to abolish the class of carriers altogether. As the calendar page turned from 1949 to 1950, another government entity was taking note of the non-scheduled airline industry: the US Congress. Members of that bicameral body were being contacted by their constituents who owned large irregular carriers. These citizens wanted to know why a government agency was deliberately trying to put them out of work. The senators and congressmen were curious. They, too, wanted to find out why this government-led attack was taking place on American small businesses. The CAB would be called to account. And so would the embattled operators of the non-certificated airlines.



**IN PART TWO** *The author explores the aftermath of the Goodkind memo, the importance of the military to the non-skeds and their ongoing heroic struggle against a government determined to see them fail*

*Along with its sister ship, LZ 130 (the second Graf Zeppelin), the Hindenburg remains the largest object ever to fly. It is seen here sailing majestically over the colossal airship sheds at Friedrichshafen on the northern shoreline of Lake Constance in southern Germany in 1936. The Olympic rings on the side of the massive airship celebrated the holding of the Summer Olympics in Berlin that year.*

PHILIP JARRETT COLLECTION







# Luftschiff Hindenburg

## The height of luxury

Germany's magnificent *Hindenburg* airship was an extraordinary feat of engineering and technical expertise. Similar ingenuity was also required to make the gargantuan airship's interior as luxurious — and, crucially, lightweight — as possible. **MICHAEL O'LEARY** takes a look at the epitome of *de luxe* 1930s air travel from the passenger's perspective





Deutsche Zeppelin-Reederei

# Luftschiff Hindenburg

An Bord

HEADED LETTER PAPER & LUGGAGE LABEL (BELOW) VIA AUTHOR

**T**HE HULL OF *Luftschiff Zeppelin* 129, named *Hindenburg*, was a streamlined shape with a length some six times its maximum diameter. It incorporated the typical Zeppelin construction of braced main rings with auxiliary rings between. The metal alloy used in the framework was an extremely light, strong aluminium alloy that had already been tested on LZ 127, the *Graf Zeppelin*. The main frames were of a flat wire-braced type that used strong steel wires for bracing. The outer cover, stretched taut over the framework, was a strong cotton fabric made waterproof by chemical treatment. Two main corridors ran the length of the *Hindenburg*, one along the very bottom, which served as the main unit and accommodated fuel and water tanks along its length, together with store rooms, freight compartments, the crew's quarters and other service details. The upper corridor ran through the centre of the Zeppelin fore and aft, and served to connect the bow and stern. The lower aisle was used as the main traffic lane while the upper gave access to the gas cells for frequent and careful inspections.

Above the control car that housed all the main instruments and controls for the operation of the airship was a radio room containing equipment for long- and short-wave radio communication. Direction-finding equipment was also located in the radio room. A telephone system, incorporating some 24 stations located throughout the airship, offered communication through a common switchboard. The staterooms for the captain and officers, as well as the mail room, were placed above the control car for accessibility.

For those unfamiliar with this glamorous and cutting-edge mode of transport, what was startling about the interior of the *Hindenburg* was the extraordinary amount of space assigned to its

passengers. Accommodation for the wealthy travellers in the massive airship was much more impressive than that aboard any other flying machine of the time.

## Smoke without fire

The airship was entered by means of two hinged gangways which lowered from the regular passenger lounges aft of the control car. Two decks, A (upper) and B (lower), were incorporated, the latter containing the bar and a smoking room, which, at the time, was touted as a great innovation, smoking in commercial airships having previously been forbidden.

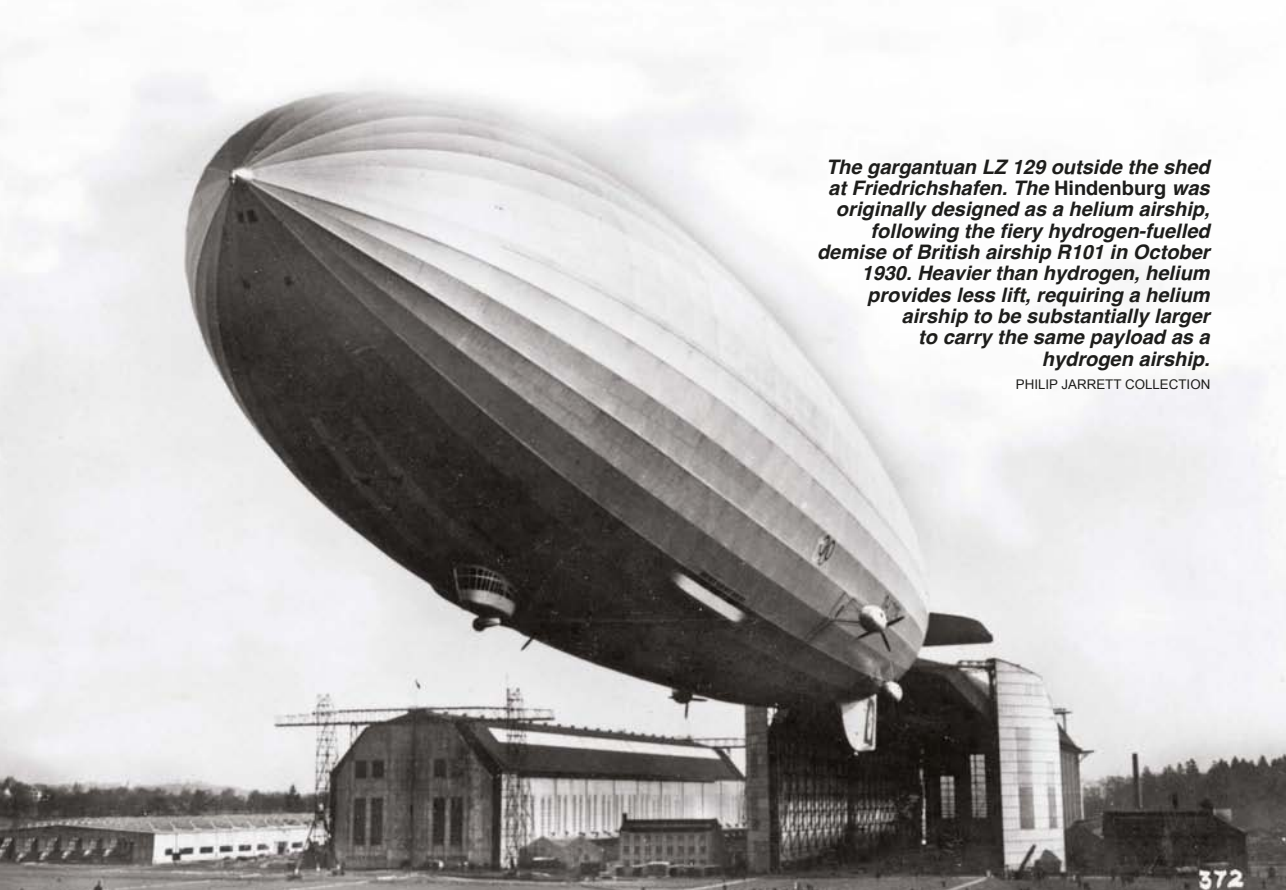
The cleverly-designed smoking room was kept at higher than ambient pressure, so that no leaking hydrogen could enter the room, and the smoking room and its associated bar were separated from the rest of the ship by a double-door airlock. One electric lighter was provided, as no open flames were allowed aboard the ship. The smoking room was painted blue, with dark blue-grey leather furniture, and the walls were decorated with yellow pigskin on which were illustrations by Otto Arpke depicting the

history of lighter-than-air flight from the Montgolfier brothers' balloon to the *Graf Zeppelin*.

To arrive at the smoking room, a passenger would pass through the small bar and enter by means of a door, which could be opened only from the inside. Passengers could not leave the smoking room until it was certain that all smoking materials had been extinguished. A steward, usually former ocean liner bartender Max Schulze, was placed on door duty to make certain this vital task had been completed; the consequences otherwise would have been catastrophic — the *Hindenburg's* highly inflammable hydrogen lifting gas could be set off by the smallest spark. The door was electrically controlled and could be opened only by the steward after he had made certain that those leaving were







*The gargantuan LZ 129 outside the shed at Friedrichshafen. The Hindenburg was originally designed as a helium airship, following the fiery hydrogen-fuelled demise of British airship R101 in October 1930. Heavier than hydrogen, helium provides less lift, requiring a helium airship to be substantially larger to carry the same payload as a hydrogen airship.*

PHILIP JARRETT COLLECTION

not endangering the ship. Specially designed ashtrays were distributed throughout the room, which automatically shut completely airtight to smother any glowing stubs of tobacco.

The flexibility of the ship's construction would be immediately noticed by the traveller, many of which noted the odd sensation of being suspended in air, or walking across a wide tightrope, even when the airship was moored. The apparent "sponginess" in the flooring was because the passageways were made up of carpeted lightweight rubber stretched along the longitudinal framework.

### **Add lightness . . .**

Naturally, the greatest challenge was designing the interior and its furnishings to achieve comfort and durability with the least possible weight penalty — every ounce counted. As a consequence, the supremacy of functionality, responsible for many developments in other fields of design, was absolutely essential in creating the furniture for the *Hindenburg*. Heavy articles of any sort were barred; the metals and textiles were of the lightest weight.

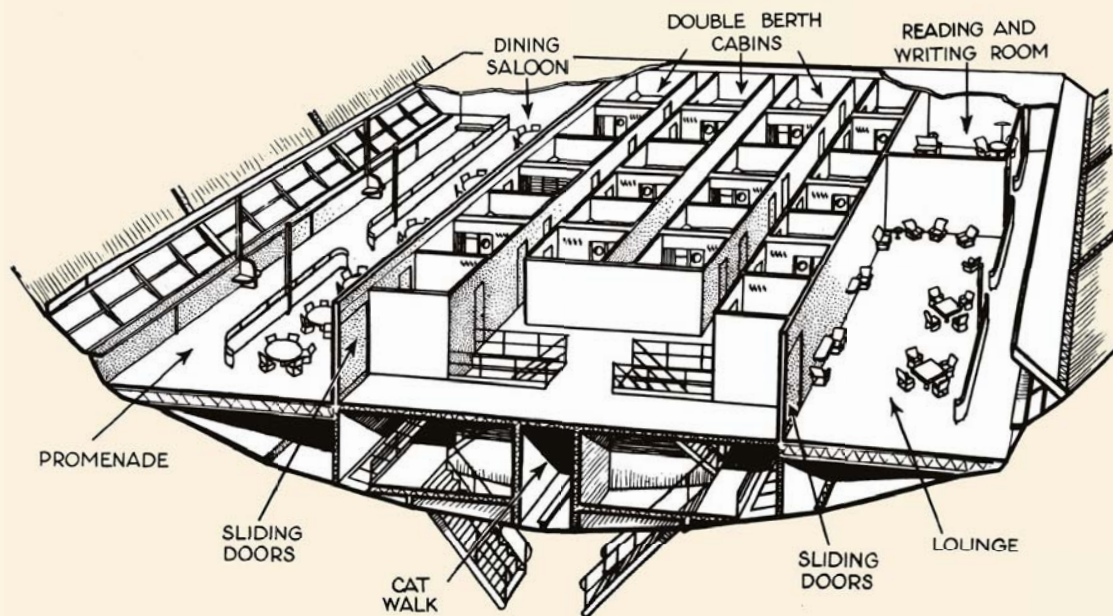
The furniture was made of Duralumin and weight was further reduced by punching out any metal not required for structural strength. This led to the furniture being designed with balance and an elegant simplicity of line, the drive



VIA WWW.AIRSHIPS.NET

**ABOVE** One of a series of rare colour photographs of the *Hindenburg's* interior, this shows the innovative, tastefully-appointed blue smoking room located in the forward section of the lower B Deck.





**ABOVE** A Max Millar illustration of the passenger accommodation area of the Hindenburg, looking towards the bow of the airship. The passenger decks were contained within the hull of the Hindenburg, in contrast to those of its predecessor, the first Graf Zeppelin, in which the passengers were accommodated within the main gondola.

for efficiency creating an aesthetic of its own, even down to the knives and forks. However, sufficient weight was saved in the furniture to make it possible to use high-quality porcelain for the tableware, instead of lightweight substitutes.

### **Progress through technology**

The Hindenburg's A Deck (upper) comprised the dining room, lounge, writing room, "promenades" on both port and starboard sides and 25 double-berth passenger cabins. The dining room (seen looking aft, **BELOW**) occupied the entire length of the port side of A Deck and measured some 15m (49ft) in length and 4m (13ft) in width. At the entrance to the dining room was a decorative panel of Hebe, the Greek

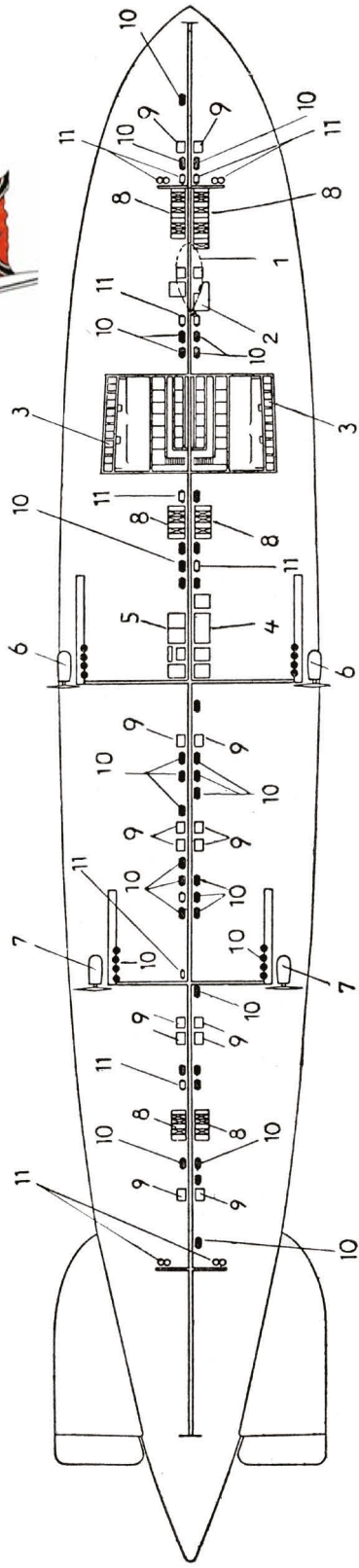
goddess of youth, holding a cornucopia.

On the walls of the dining room were small murals recording vivid impressions of the *Graf Zeppelin's* voyages from Germany to South America. The dining salon could be arranged for the captain's dinner or, more ordinarily, arranged with tables for two and four. The large windows were placed at an angle so that passengers could always see what they were passing over, whether they were far out over the Atlantic, sailing effortlessly over the towers of Manhattan or about to land after a few days' passage to Friedrichshafen. The chairs were designed by Fritz August Breuhaus using lightweight tubular aluminium and were upholstered in red.

On the same level but on the starboard side



# Luftschiff Zeppelin 129 "Hindenburg" data



The illustration ABOVE, from a 1930s German aviation Wörterbuch (dictionary), shows the Hindenburg's various cargo compartments and positions from a plan perspective. The key for the numbers is as follows: **1** Control car **2** Radio booth **3** Guest bedrooms **4** Large cargo compartment **5** Central electrics room **6** Forward engine gondolas **7** Aft engine gondolas **8** Crew compartment **9** Store room **10** Fuel tanks **11** Water tanks

**Powerplant** 4 x 1,050 h.p. Daimler-Benz DB602 (LOF 6) liquid-cooled 50° V16 diesel aero-engines  
**Gas capacity** (at 100 per cent inflation) 200,000m<sup>3</sup> (7,063,000ft<sup>3</sup>)

**Chief designer** Ludwig Dürr

**RIGHT** The Hindenburg's "Führergondel", or control car, was divided into three sections: the control room at the front; a navigation room in the centre and an observation room or lounging area at the aft end.

Philip Jarrett Collection

Typical gross lift using hydrogen 232,000kg (511,500lb)  
 Maximum fuel 65,000kg (143,300lb)

**Performance**  
 Maximum speed 135km/h (84 m.p.h.)  
 Maximum range 16,500km (10,250 miles)  
 at 125km/h at 78 m.p.h.)

**Crew** 40  
**Passengers** 50, later 72  
**Cost** DM9,000,000

**Dimensions**  
 Overall length 245m (803ft 10in)  
 Max diameter 41.2m (135ft 2in)  
 Number of frames 48 including 16 main frames  
 Spacing of main frames 15m (49ft 2in)  
 Fineness ratio 6.02:1  
 Number of gas cells 16  
 Number of main longitudinals 32

**Weights**  
 Empty 130,000kg (286,600lb)  
 Disposable load 102,000kg (224,900lb)







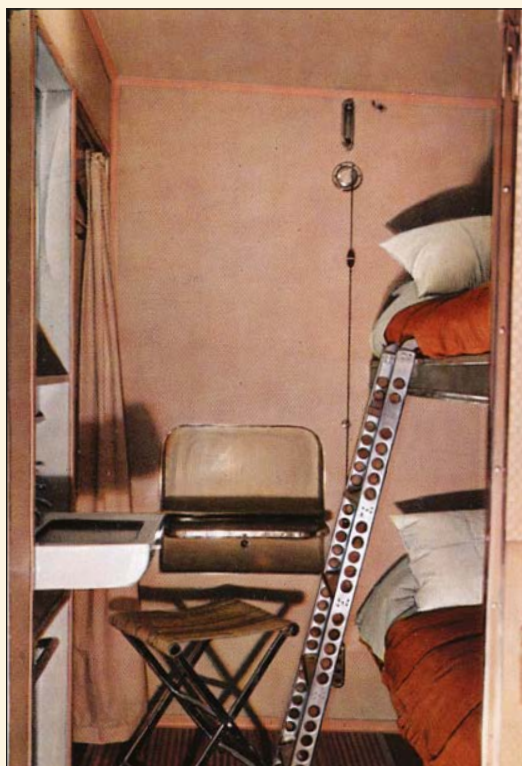
**ABOVE** Located on the Hindenburg's starboard side, the passenger lounge featured specially designed, startlingly modern-looking furniture upholstered in brown. Note the maps adorning the lounge walls. **BELOW** Another rare colour photograph of the Hindenburg interior, this time showing one of the somewhat "cosy" passenger cabins.

were the lounge and the writing room. The former was 10m (33ft) in length and was decorated with large maps depicting the routes of the great explorers Magellan, Cook, Vasco de Gama and Christopher Columbus, as well as the routes undertaken by LZ 126 on its delivery flight to the USA (where it became the *USS Los Angeles*), the *Graf Zeppelin's* South American flights and the transatlantic crossings made by the German ocean liners *Europa* and *Bremen*.

In this main salon there were facilities for broadcasting and receiving radio programmes and, during 1936, it was equipped with a specially-made Blüthner baby grand piano constructed from lightweight Duralumin and covered with yellow pigskin. It was not aboard the *Hindenburg* during its final flight, however.

Company literature claimed that the ship's concerts and amusement schedules for the evening rivalled those aboard the most luxurious ocean liners. The chairs, also designed by Breuhaus, were similar to those in the dining room but were upholstered in brown. Adjacent to the lounge was a small writing room, decorated with more paintings by Arpke, this time depicting exotic scenes from around the world.

The overarching need for weight reduction resulted in the development of some ingenious design techniques. Specially-made lightweight







**ABOVE** “Oh, the humanity!” — in one of the most widely seen events in 20th Century history, the *Hindenburg* bursts into flames at the naval air station at Lakehurst, New Jersey, on May 6, 1937. It marked the end of the rigid airship as a commercial enterprise, although the higher cost of using safer helium would have had the same effect.

materials were used for the tops of tables and desks. Woven fabrics in smooth textures were used for some of the upholstery, although leather was used for the furniture nearest to the windows along the sides of the ship, as the designers realised that curious passengers would give most wear to the chairs placed near the windows where the impressive panorama of the world below could be seen. The fabric backs of the chairs were detachable so they could be removed for inspection of the metalwork.

### **The passengers' quarters**

There were 25 cabins of approximately 2m (6ft 6in) x 1.7m (5ft 6in) for the passengers' sleeping quarters. Each room had two berths, an upper and lower. Each upper was designed to be raised into a niche in the wall, thus converting the lower into a sofa. The walls comprised a thin layer of foam covered by fabric. The cabins were decorated in various colour schemes based on a palette of light blue, grey or beige.

A steward could be summoned by means of a call button, and each cabin was fitted with a fold-down desk, a lightweight plastic wash basin with hot and cold running water, and a small wardrobe area for the hanging of evening wear. Toilets were located on the lower B Deck, as was a single shower. Unlike the *Graf Zeppelin*, in

which the passenger cabins were located in the main gondola, the *Hindenburg's* passenger cabins had no windows. This was changed during the winter of 1936–37, however, when additional berths were incorporated into the *Hindenburg*, the new cabins (aft of frame ring No 173) having an outside view. The cabins on A Deck were connected with the crew's living and sleeping quarters on B Deck by means of a short stairway.

As well as accommodating the smoking room, the lower deck comprised the crew's sleeping quarters, the radio and electrical rooms and the post office. Fuel, fresh water and ballast tanks were located on the keel, which offered access to the control car, engine gondolas and docking stations. The kitchen was also located on Deck B, and meals were transported to the dining room above by means of a dumb waiter.

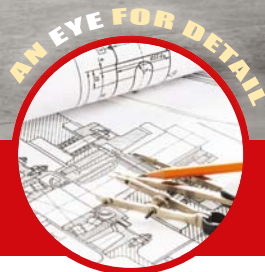
There were plans for greater Zeppelins with even more magnificent interiors, but by the time of the *Hindenburg's* fiery end at Lakehurst it was already clear that the era of hydrogen-filled airships was over. It was the end of a highly innovative, if ultimately fruitless, chapter in the history of commercial aviation.



*The Editor would like to thank Daniel Grossman of the excellent (and highly recommended) [www.airships.net](http://www.airships.net) website for his invaluable help with this feature*

*The sole Spitfire Mk III, N3297, shortly after its completion, waxed and polished to maximise performance. Note the short-span wings and full doors on the mainwheels.*

PHILIP JARRETT COLLECTION



## PERFECT THIRD?

**JUANITA FRANZI** introduces a new regular series in which she takes a detailed look at some lesser-known airframes and their markings. First up is the transitional Spitfire Mk III

**I**N EARLY 1939, with the Spitfire Mk I in full production, Supermarine began designing a second-generation "Superiority Spitfire" variant that would ultimately evolve into the Mk III.

A Mk I airframe, N3297, was taken from the production line in early 1940 and modified to incorporate a number of improvements, including a retractable tailwheel, the strengthening of the airframe, a Rolls-Royce Merlin XX engine and "clipped" wings of reduced span.

Finished in the standard fighter scheme of the day, the new variant made its maiden flight in the hands of Supermarine test pilot Jeffrey Quill on March 16, 1940. Impressed with the aircraft's performance, Quill nevertheless voiced concerns about the short-span wing.

At the end of March 1940, N3297 was sent to No 11 Group, Fighter Command, to conduct service trials, and further testing was undertaken that September at Boscombe Down, the aircraft reaching a maximum speed of 400 m.p.h. (645 km/h) at 21,000ft (6,400m), significantly higher than the Mk I

or Mk II. The new variant's prospects were looking bright and an order for 1,000 Mk IIIs was mooted in October 1940.

Testing of N3297 by Supermarine and the A&AEE continued into 1941, by which time events had overtaken the new variant. The limited-production Merlin XX engine was considered more important for continued Boulton Paul Defiant and Hawker Hurricane production and another Spitfire variant, the Mk V, was about to fly. Essentially a Mk I/II fitted with a derivative of the Merlin XX, the Merlin 45, the Mk V offered improved performance and minimum production delays. Development of the Mk III was cancelled, although many of its design features would reappear on later Spitfire variants.

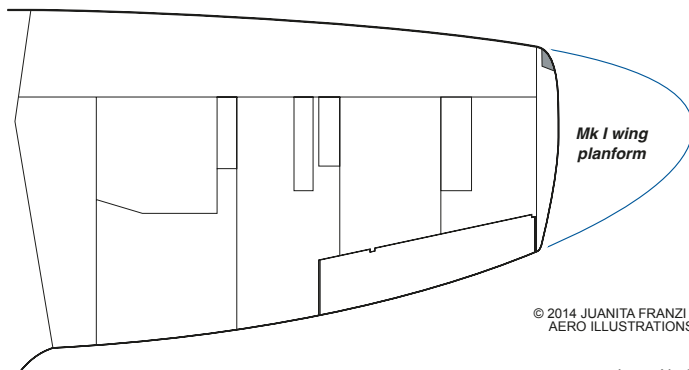
The Mk III prototype soldiered on as a testbed for the Merlin 60/61 into late 1942, undertaking trials work which would ultimately lead to the Mk IX.

In October 1943, N3297 was classified as an instructional airframe and given maintenance serial 3396M. The ultimate fate of this significant Spitfire airframe appears to be unknown.



### The Mk III clipped wing

*The most immediately noticeable modification introduced on the Spitfire Mk III was its shorter wing, based on that of the Mk I but "clipped" at rib 19, significantly reducing the type's wingspan from 36ft 10in (11.2m) to 30ft 6in (9.3m). The new wingtip incorporated a streamlined cover for the navigation lamp. Test pilot Jeffrey Quill voiced concerns that the reduced wing area led to a longer landing run and would make the Spitfire harder to discern from the Messerschmitt Bf 109. A Mk I wing was fitted to N3297 in 1941.*



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# SUPERMARINE SPITFIRE MK III N3297, March 1940-October 1941

## MARCH 1940

N3297 was originally given the standard factory finish as applied to Spitfire Mk I's between late February and mid-May 1940. The underside was painted Aluminium, with the port wing in Night and the starboard wing in White. The cowlings were 4in (102mm) longer to accommodate the Rolls-Royce Merlin XX engine. The aircraft was fitted with a three-bladed propeller, various types of which were tested.

## MAY 1940

The fin flash and the yellow outer ring of the roundel were applied in response to an Air Ministry directive of May 1, 1940. Yellow undersurfaces for non-operational aircraft had been introduced in late 1939, and instructions of late 1940 specifically included prototype aircraft. Various propellers and spinners were fitted to N3297, including Rotol three- and four-bladed props of 10ft 9in (3.28m) diameter and a Dural de Havilland propeller of 11ft (3.35m) diameter.

## OCTOBER 1941

With the cancellation of the Mk III in April 1941, N3297 was sent to Rolls-Royce at Hucknall to become an engine testbed, first flying with a two-stage supercharged Merlin 60 on August 19, 1941. The following month it was fitted with a Merlin 61, these trials aiding the development of the Mk IX. Its markings by this time complied with instructions of August 1940 stipulating underwing roundels of 50in (1.27m) diameter and an instruction of December 1940 specifying 27in (685mm) fin flashes.





# DEATH OF A VISIONARY

## EDWARD T. BUSK AND “STABILITY JANE”

100 years ago Britain lost one of its most promising aeronautical minds when the 28-year-old Ted Busk was killed flying a B.E.2c. **ADRIAN ROBERTS** examines the brief life of the inspirational airman and re-evaluates the B.E.2c's reputation as a killer

**O**N THE EVENING of November 5, 1914, two aeroplanes took off from the Royal Aircraft Factory at Farnborough, Hampshire, and flew into the setting sun over Laffan's Plain. The pilots were two of the most talented aircraft designers and engineers of the time, but their fates could not have been more different. One lived to be 82 and became one of the most successful and best-known aviation industrialists of the 20th Century; his name was Geoffrey de Havilland. The other, arguably even more talented, died that evening aged just 28, when his aeroplane, a prototype Royal Aircraft Factory B.E.2c, burst into flames and fell to earth; his name was Edward Teshmaker Busk.

Over the next four years thousands of brilliant young men perished with their talents unfulfilled, and their names have been forgotten by all but their families. But Edward Busk was among the very few whose passing merited a letter to his family from the King, and a posthumous Gold Medal of the Aeronautical Society of Great Britain.<sup>1\*</sup> The Director of Military Aeronautics, Lt-Col Sefton Brancker, wrote to Busk's mother: “[The death of] your son was an irreparable loss to the British Army and indeed the nation . . . [his was] a combination of exceptional brain and scientific knowledge with perfect courage”. Fortunately, we know a little about Busk as a man and an engineer from a memoir published in 1917 by his mother, who seems to have been a remarkable woman, widowed young, who lost two sons flying in the Great War.<sup>2</sup>

Busk's principal achievement was the development of the perfectly stable aeroplane, which entered production as the B.E.2c and was developed into the R.E.8. In a sad twist of history, Busk's name has become associated with the negative aspects of those aircraft, when it was found that their inherent

*Much of Ted Busk's experimental research into inherent stability in aircraft was undertaken on modified Royal Aircraft Factory B.E.2s. Here Lt S.C. Wingfield Smith of the Royal Aircraft Factory brings a B.E.2a in for a landing during experiments with modified “fin struts” circa 1913–14.*

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*\* ENDNOTE references, indicated by numbers at appropriate points in the text, are provided at the end of the feature*



**"He passed into  
another life so  
suddenly that one  
can hardly call it  
death; like Elijah  
of old he was  
translated in his  
chariot of fire..."**





**ABOVE LEFT** *The Harrow boy* — in January 1900 Ted Busk went to Harrow School, where, according to his mother, “he was too much of a ‘free lance’ to like so much mapped-out work, and was always longing for more time to carry out his own schemes and ideas”. **ABOVE RIGHT** Keen climber Busk on Stickle Pike in the Lake District.

stability was an often fatal liability in air combat. But this was only evident with hindsight; stability is an essential characteristic in a reconnaissance aircraft. It is doubtful that the B.E.2c's casualty rate was worse than that of any other two-seater, but it was picked on with glee by those with an axe to grind against the Royal Aircraft Factory and the government's handling of the war.

## THE BEGINNING

Edward Busk was born on March 8, 1886, in the family home, *Ford's Grove*, at Winchmore Hill near Edmonton in what is now North London. He was the eldest child of Thomas Teshmaker Busk, and his wife Mary.<sup>3</sup> Three more children were born: Dora, Henry and Hans. They moved to a country house, *Hermongers*, near Rudgwick in Sussex, in 1889, but their father died in 1894.<sup>4</sup>

Edward (always known as Ted, even as an adult) showed an interest in science and engineering from an early age. For most such boys at the time, the steam railway engine was the height of technology. He spent time with various friends of his mother who nurtured this interest. There is a letter written when he was ten to a Mr Clegg, in which Ted talks about multiplying the pounds [pressure] per square inch by the area of the piston to obtain the tractive force of an engine — probably something of a simplification!

His mother was able to send him to Harrow School where his interest in science continued. He

also excelled at football, rowing and gymnastics. He then went up to King's College Cambridge, to study Mechanical Sciences. He was a contemporary of Rupert Brooke — one imagines that the paths of the upper-class poet and the science geek would not have crossed very much, but they had a mutual friend, the writer Shane Leslie, who wrote: “It was a glory for King's that Rupert Brooke and Edward Busk should have been contemporaries within her gates. Both met early and tragic ends”.

Busk also became a keen rock-climber during that time, later being president of a group of climbers mainly from Cambridge called the “Broad Teeth”; they climbed in the Lake District whenever they could and Busk occasionally made trips to the Alps.

Busk graduated from Cambridge with First Class Honours, and did another year of post-graduate research, winning the John Winbolt prize, which is still awarded for an “essay on a subject related to Civil Engineering”. (Was any other aviation pioneer more highly qualified academically? Geoffrey de Havilland had only a Technical College education).

During 1909–11 Busk worked for Halls of Dartford, a marine engineering firm which at the time was diversifying into refrigeration equipment and the “Hallford” lorry. No doubt he honed his practical skills while there. He then spent several months back at home in a workshop





**ABOVE** The R.E.1 was a development of the B.E.2 designed for research into an inherently stable reconnaissance aircraft, and differed from the latter in being a single-bay biplane with staggered wings. Only two R.E.1s were built, both initially fitted with wing-warping controls. This is the first, No 607, after having been fitted with ailerons.

that he set up himself, researching the effect of wind gusts on different shapes, as well as the strains on wires and ropes. This appears to have been freelance work for the National Physical Laboratory (NPL) at Teddington, the Director of which, Dr Richard Glazebrook, took a special interest in the young Busk.

Busk's interests were now turning to aviation, and the gust experiments were the result of an early realisation of the importance of stability. He learned to fly during this time, at the Aeronautical Syndicate Ltd's flying school (ASL) at Hendon. Curiously, he never took his Aero Club certificate, although there was certainly no doubt about his flying abilities. His obituary in *Flight* states that he did not consider a certificate necessary as he saw his ability to fly as purely a means of pursuing his scientific research.<sup>5</sup>

## TO THE FACTORY

Busk was recommended to Mervyn O'Gorman, Director of the Royal Aircraft Factory, by Dr Glazebrook and his erstwhile Cambridge tutor, Professor Bertram Hopkinson,<sup>6</sup> and joined the Factory in June 1912. He was given "general control of chemical, metallurgical and physical research and test work" at the Factory.<sup>7</sup> An article published in August 1912<sup>8</sup> describes an instrument invented by Busk known as a "Trajectorygraph", which was for measuring and recording glide angles. The vertical distance was measured by a

barometer and the horizontal distance by a pitot tube, which registered photographic traces on to a rotating drum enclosed in a box. By May 1913, this had developed into a "Ripograph", also invented by Busk: this recorded on a photostrip the pilot's movements in warping and steering, and the speed, inclination and roll of the aircraft — an early flight data recorder.<sup>9</sup>

In a highly technical *Flight* article in January 1914, Busk contrasts the airspeed indicator — which was then operated by the airflow against a spring — with the velograph, which used a pitot tube to give warning of a stall by "balancing lift against speed".<sup>10</sup> He warns that pilots should leave a considerable margin of error, especially when turning, but this certainly indicates an early attempt to rely on instruments rather than the "seat of the pants".

The aeroplane with which Busk was most closely concerned was the R.E.1, a refinement of the B.E.2/B.E.2a, the new designation deriving from "Reconnaissance Experimental". Two of these were built, with 70 h.p. Renault engines, the first flying in September 1913. They were later transferred to the Royal Flying Corps (RFC) with serial numbers 607 and 608. Busk used both extensively for his stability tests. For some time they had fixed vertical surfaces at intervals along the upper wings. An article in *The Times* of May 20, 1914, describes some of the contemporary thinking behind this feature:

"Sideslip produces a side wind on the 'fin' surfaces of the aeroplane. These are made up of the lateral surfaces of the struts, wires, wheels, fuselage. If the fin near the rudder is too large the side-wind up it [sic] tends to throw the stern around, and in the absence of correcting action from the pilot the machine nose-dives. If the fin is too small the same trouble arises in a different set of circumstances."

The article also deals with longitudinal stability: "Many an argument has taken place between those who, to give the pilot greater control, insist on the whole tail being mobile [e.g. the highly unstable Morane], and certain authorities who insist that the damping effect on oscillations of the fixed portion of the tail was of priceless value to the pilot".

Photographs show B.E.2s fitted with various fin surfaces on the wing, as well as the large rectangular tailplane later fitted to the B.E.2c, and B.E.2s allocated to the Factory were used for continuous developments of the type. One example had the interplane struts widened near the top to provide extra fin surface.<sup>11</sup> Ultimately, Busk concluded that extra surface forward was unnecessary, as long as the fin at the tail was of the correct area.

Busk test-flew the machines in all weathers, and in November 1913 flew for several hours in wind-speeds of up to 38 m.p.h. (61km/h) without using

any controls except for landing and steering. On another occasion he took an R.E.1 up to a great height, put it into a vertical dive, removed his hands and feet from the controls, and found that it righted itself. This was no small feat at the time, in an open cockpit, with no parachute, barely ten years after the Wright brothers had first flown.<sup>12</sup>

## A ROYAL OCCASION

*The Times* report of May 20, 1914, also states:

"The King and Queen and Princess Mary paid a visit yesterday afternoon to the Royal Aircraft Factory, and witnessed a flight by the stable Army aeroplane R.E.1, in which Colonel Seely [Secretary of State for War, later Viscount Mottistone] flew for about fifteen minutes last week. On that occasion neither he nor the pilot, Mr E.T. Busk, touched the balancing control or the elevator. The rudder was used by Colonel Seely alone, in order to steer where he wanted to go, the machine taking up its proper angle of bank. Colonel Brancker had made a similar flight with the same pilot. Yesterday the passenger was Major Clive Wigram, Equerry to the King, who was taken for a flight of about ten minutes in the presence of their Majesties, without the controls being touched."

The research results from the R.E.1 were incorporated into the B.E.2c, the first two of which first flew in May 1914, converted from B.E.2



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airframes 601 and 602. These fulfilled all that was expected of them. Busk flew Col Frederick Sykes, CO RFC Military Wing [later Air Vice-Marshal and MP] from the Factory to Salisbury Plain and back, neither of them touching the controls and able to write notes throughout. Sefton Brancker flew the machine solo and later wrote: "I flew the first stable B.E.2c as proof that stability would enable even a comparatively old gentleman [he was only 37!] from the War Office to fly with safety and write reports in the air. The stress of war came shortly afterwards and the importance of stability was lost sight of in the torrent of demands for great manoeuvrability. I doubt if any machine produced since has been as perfectly stable as that first machine, which was derisively known as 'Stability Jane'. But aerial transport is calling loudly for this quality now [the 1920s]".<sup>13</sup>

Despite his commitment to research, Ted Busk was not immune to the sheer beauty of flight. On March 25, 1914, he wrote to his sister Dora:

"We have got one of our new machines especially arranged for climbing, and arranged as a single-seater. She has a 110 h.p. engine so she is a rather 'spot'<sup>14</sup> single-seater. Yesterday I took her up to 11,000ft [3,300m], which is the highest I have done in an aircraft. I certainly had one of the finest cloud views I have ever seen. I got above the first layer at 2,000ft [600m], but I reached 10,000ft [3,000m] before I got above the next layer

of big clouds. The great cumulus clouds nearby, white in the sunlight, and a distant level of snow-white stratocumulus miles away to the west, were perfectly glorious.

"It was very sad to have to come back and see the dull undermaths of them again. We had arranged air from the radiator to warm the pilot, so I went up without any extra clothes, but coming down [with the engine off] the air came through cold, and it was a biting cold too."

Frustratingly for the historian, many pilots of this era did not think it important to specify what kind of aeroplane they were flying. This single-seater had a 110 h.p. engine, but it had a radiator, and so could not have been the S.E.2 or S.E.4, which had Gnome rotaries. He hints that it was a converted B.E.2, but what water-cooled 110 h.p. engine was available?

## THE END OF THE ROAD

Busk was personal friends with test pilots Geoffrey de Havilland and Neville Usborne, to the extent of having meals at their homes and meeting their wives. Geoffrey de Havilland wrote: "Busk was very likeable and entirely without 'side'. Round-faced and smiling, he was anything but the typical brainy scientist. He often came round to our house in the evenings, and sang songs in a boyish voice and rather out of tune". Busk and Usborne (later also killed test-flying) talked of attempting a round-the-world flight together.

Busk died in B.E.2c serial number 601 on November 5, 1914. Geoffrey de Havilland, who was flying above him, wrote: "Suddenly and without warning, flames shot out of the engine, in seconds reaching to the tail. The B.E.2c's nose tipped forward, evidently beyond all control, and went straight towards the ground like a flaming torch. It was a tragic loss for his family and for aviation. The sight was very terrible, and for long afterwards I would wake in the middle of the night from dreams in which I saw it all happen again . . . poor Busk must have been dead before he hit the ground".<sup>15</sup> Mary Busk wrote: "He must have passed into another life so suddenly that one can hardly call it death; like Elijah of old he was translated in his chariot of fire". We can only hope that they were right.

The only other B.E.2c was in France by then, and the accident was one reason why it was January 1915 before other B.E.2cs started to arrive there. Also lost in the crash was the prototype R.A.F. 1a 90 h.p. engine, an improved version of the Renault; again this conspired to delay the type's development.

The aircraft and pilot were so consumed by the flames that the precise cause of the accident was never established. There was a rumour that he was carrying a pyrotechnic, either for weapons

**Busk at the controls of the second R.E.1, No 608, fitted with warping wings and four fixed fins on the upper wing, which were used for his stability trials. After Busk's death, Col Mervyn O'Gorman, Superintendent of the Royal Aircraft Factory, recalled that Busk "did the most magnificent things without announcing any intention and without applauding audience. With his hair blown about by a hatless flight, he would walk into my office and report the success of an experiment. He forgot that it was brilliant, or it did not occur to him . . ."**







**ABOVE** Lieutenant Wingfield Smith poses in a B.E.2a with fin struts in January 1913. Improvements to the fuselage decking, revised flying controls and a new fuel system resulted in the B.E.2b; this was itself modified based on the results of trials with the R.E.1s into the B.E.2c, which incorporated staggered wings and ailerons.

testing or as a prank, but there appears to be no substantiation of this.<sup>16</sup> Soldered or screwed fuel pipe joints came apart all too often in those days, and a spark or backfire would ignite the spillage. This was clearly the belief of the writers of Busk's obituary in *Flight*.

Test pilot Frank Courtney survived a very similar experience in 1916, also in a B.E.2c up from Farnborough: "Fortunately I was heading for the Factory gates, a mile or two away. As the cold engine picked up, it promptly backfired and wisps of black smoke began to come back from the cowlings. The wisps rapidly became clouds in which flickers of flame appeared. I did not know then, that during the glide a stuck needle had

been allowing fuel to dribble into the new lower cowlings which had no provision for drainage.

"I put the 'plane into a steep sideslip to carry the increasing smoke clear of the cockpit. But I had to straighten out for landing and the choking smoke and ominous heat closed around me. The wheels hardly touched before I had my belt unfastened and was overboard. If I had been 200–300ft [60–90m] higher or over ground where I couldn't land, another mysterious and fatal fire such as the one that killed Edward Busk in another B.E.2c, would have had to go on the records."<sup>17</sup>

Ted Busk is buried in Aldershot Cemetery. Mrs Busk includes several pages of letters of condolence in her memoir, including one



**The machine in which Busk was killed, B.E.2c No 601, seen here before the accident sporting two "floating fins", each of 6ft<sup>2</sup> (0.6m<sup>2</sup>), atop the upper wing centre section. These were pivoted on their leading edges and could be manipulated by the pilot.**



**ABOVE** By the spring of 1915 B.E.2cs had become standard equipment for first-line Royal Flying Corps squadrons on the Western Front. These Daimler-built 90 h.p. Royal Aircraft Factory 1a-engined B.E.2cs were photographed in France in 1915 while serving with No 16 Sqn, which had received its first examples in February of that year.

from Major Wigram on behalf of the King, and several from scientists and aviation pioneers including Mervyn O'Gorman, Lord Rayleigh, Sefton Brancker, Richard Glazebrook, Bertram Hopkinson, Robert Mayo, Neville Usborne and many others.

### THE B.E.2c - MONSTER OR MYTH?

I would like to conclude with a brief defence of the B.E.2c, an aeroplane severely criticised for suffering a high casualty rate during the war. This is often attributed to its inherent stability, which by its nature hampered its manoeuvrability and made it vulnerable in combat, particularly when attacked by Fokker monoplanes with guns synchronised to fire through the propeller arc. Even if this accusation were completely justified, it is doubtful that anyone could have foreseen this development in air fighting.

The B.E.2c was designed as a reconnaissance machine, and as such it was probably the best in the world at the time. But the Royal Aircraft Factory, being a government organisation, was an easy target for anyone from the left or the right of the political spectrum who wanted to criticise the government. David Lloyd George and C.G. Grey, Editor of *The Aeroplane*, targeted the B.E.2c in their criticisms. Aircraft designer and Supermarine founder Noel Pemberton Billing levelled a long list of criticisms at the Factory in the House of Commons. [See Michael H. Goodall's feature on Pemberton Billing's World War One quadplanes, Pemberton Billing and the Four-Winged Farrago, in *TAH8 - Ed.*] The rather eccentric Pemberton Billing blamed it for every

## ROYAL AIRCRAFT FACTORY B.E.2c DATA

**Powerplant** 1 x Royal Aircraft Factory 1a eight-cylinder upright 90° Vee engine rated at 108 h.p. at 1,800 r.p.m. (take-off power)

### Dimensions

Span	36ft 10in	(11.23m)
Length	27ft 3in	(8.31m)
Height	11ft 4in	(3.45m)
Wing area	396ft <sup>2</sup>	(36.79m <sup>2</sup> )

### Weights

Empty	1,370lb	(623kg)
Loaded	2,142lb	(972kg)

### Performance

Max speed	72 m.p.h.	(116km/h)
	at 6,500ft	at 1,980m
	71 m.p.h.	(114km/h)
	at 10,000ft	at 3,050m

### Climb

to 6,500ft (1,980m)	20min	
to 10,000ft (3,050m)	45min 15sec	
Service ceiling	10,000ft	(3,050m)
Endurance	3hr 15min	

### Armament

Initially 1 x rifle or carbine, fired by observer. Later examples carried 1-4 x 0.303in Lewis machine-guns in various configurations. Flown solo as a bomber, R.A.F. 1a-powered B.E.2c could carry 1 x 230lb (104kg) bomb or 2 x 112lb (51kg) bombs. Home Defence B.E.2cs could be fitted with le Prieur rockets on interplane struts

accident that had ever happened to a Factory machine, including Busk's, as well as the combat losses. He described the B.E.2c as "Fokker Fodder", and their crews as "being murdered rather than killed". This resulted in a Parliamentary enquiry, which largely exonerated the Factory, dealing with each example individually.<sup>18</sup>

Consider the list of victories of Fokker ace Max Immelmann (see table at right, with B.E.2c "kills" in red). Of his 14 confirmed victories, six were indeed B.E.2cs, but the others included two Moranes, three Vickers F.B.5s, two Bristol Scouts and an F.E.2b (plus two unconfirmed F.E.2bs and an unrecognised type). The key point here is that the B.E.2c was by far the most common British two-seater. It equipped at least ten RFC squadrons on the Western Front, whereas only one squadron was fully equipped with Moranes, only two with F.B.5s and three with F.E.2bs (during 1915–16). A German pilot was statistically most likely to encounter a B.E.2c. Max Ritter von Mulzer accounted for six F.E.2bs and two B.E.2cs, plus other types, and Gustav Leffers dispatched five B.E.2cs and three F.E.2bs.

There is a case for saying that the pusher types, such as the F.E.2b, with their almost complete inability to protect themselves from the rear, were inferior combat machines to the B.E.2c; they were certainly an evolutionary dead-end, which the latter most definitely was not. Of course the nation was shocked by B.E.2c losses, but this was the first such instance in history. It became evident that most multi-seaters fared badly against single-seaters. As history progressed, many of the B.E.2c's successors had horrendous loss rates. Consider the Sopwith 1½-Strutter in early 1917, the D.H.9 in 1918, when sometimes whole flights were lost, or the Fairey Battle in 1940.

## MAX IMMELMANN'S AERIAL VICTORIES

Date	Time	Type
<b>1915</b>		
<b>August 1</b>	<b>0615hr</b>	<b>B.E.2c (serial 2003)</b>
September 9		Unknown biplane*
<b>September 21</b>	<b>1000hr</b>	<b>B.E.2c (2004)</b>
<b>October 10</b>	<b>1500hr</b>	<b>B.E.2c (2033)</b>
October 26	1005hr	Vickers F.B.5 (5464)
<b>November 7</b>	<b>1545hr</b>	<b>B.E.2c (1715)</b>
December 15	a.m.	Morane Parasol (5087)
<b>1916</b>		
January 12	0830hr	Vickers F.B.5 (5460)
March 2	a.m.	Morane BB (5137)
March 13	1255hr	Bristol Scout C (4678)
<b>March 13</b>	<b>1740hr</b>	<b>B.E.2c (4197)</b>
March 29	1100hr	F.E.2b (6352)
<b>March 30</b>	<b>1115hr</b>	<b>B.E.2c (4116)</b>
April 23	0945hr	Vickers F.B.5 (5079)
May 16	1800hr	Bristol Scout C (5301)
June 18	1700hr	F.E.2b (6940)*
June 18	2145hr	F.E.2b (4909)*

\* Unconfirmed

Did the B.E.2c lack manoeuvrability? It could certainly be looped. William Sholto Douglas, later Marshal of the RAF, was flying a B.E.2c when he was attacked by Fokkers, which he evaded by flying at treetop height and throwing it around so violently that his observer was sick — all over Douglas's goggles.<sup>19</sup>

It is beyond doubt that flying on the Western Front was inherently dangerous, but there is also a case for suggesting that the B.E.2c and its designers and test pilots have historically been singled out for unfair criticism.



## REFERENCES

- 1 Not "Royal" until 1918
- 2 Busk, Mary; *Edward Teshmaker Busk* (Robert MacLehose, Glasgow, 1917). Most of the information in this article comes from this memoir unless otherwise stated
- 3 Thomas Teshmaker Busk (1852–1894) married Mary Acworth, (1854–1935). The Teshmakers were the Lords of the Manor of Edmonton; *Ford's Grove* was their house. Thomas's grandfather had married the last heiress of the Teshmakers. See [www.british-history.ac.uk/report.aspx?compid=26939](http://www.british-history.ac.uk/report.aspx?compid=26939)
- 4 Hans Acworth Busk, born 1894, joined the Royal Naval Air Service before the First World War. He was declared Missing in Action on January 6, 1916, after a bombing raid on a Turkish target in a Henry Farman while serving with No 2 Wing at Mudros. The author has received verbal information that Henry Gould Busk (1890–1956), spent some of his career at the Royal Aircraft Establishment. Mary Agnes Dorothea Busk (1888–1960) was known as Dora and her married name was Morse
- 5 Obituary, *Flight*, November 13, 1914
- 6 Bertram Hopkinson was another youthful genius lost prematurely. Born in 1874, he was a Cambridge Professor of Mechanism and Applied Mechanics at 29 and a Fellow of the Royal Society at 36. During the First World War he served in

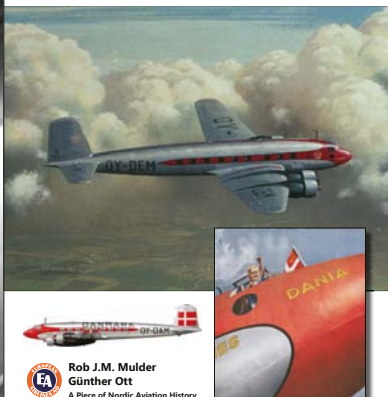
the Royal Engineers while undertaking research. He learned to fly and was killed in a Bristol Fighter crash while flying from Martlesham Heath to London in August 1918

- 7 *Flight* obituary, op cit
- 8 *Flight*, August 17, 1912
- 9 Skelton, Marvin L.; *E. T. Busk: An Irreparable Loss, Cross & Cockade* Vol 14, No 3, 1983
- 10 *Flight*, January 24, 1914
- 11 Hare, Paul R.; *Fokker Fodder: The Royal Aircraft Factory B.E.2c*, Fonthill, 2012
- 12 Skelton, Marvin L., op cit
- 13 Ibid
- 14 "Spot" is quoted as such by Mary Busk and Skelton, but it is possible that Busk meant to write "Sport" and the mistake was quoted without correction
- 15 de Havilland, Sir Geoffrey; *Sky Fever*, quoted in Skelton op cit
- 16 Hare, Paul R., op cit
- 17 Courtney, Frank; *The Eighth Sea*, Doubleday, New York, 1972
- 18 Hansard, quoted in *Flight*, August 16, 1916
- 19 Franks, Norman; *Sharks Among Minnows*, Grub Street, London 2001



## Focke-Wulf Fw 200 Condor

With Danish Air Lines in War and Peace  
1938-1946



Rob J.M. Mulder  
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A Piece of Nordic Aviation History




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**“IT WAS A JAGUAR D-TYPE  
ON STEROIDS. IT WAS  
THE ROLLING STONES  
IN SURROUND-SOUND  
AFTER 8 GALLONS OF LSD”**



In December 1967 journalist and keen aviation enthusiast **JEFFREY WATSON** (seen here on the left, seven miles above the North Sea at Mach 2) secured the ride of a lifetime when he persuaded the men from the Ministry that he needed a flight in a two-seat version of the brutishly beautiful English Electric Lightning. The training for the supersonic sortie — including a ride on the dreaded ejection trainer — was tough; then came the ballistic trajectory to 40,000ft in a double-barrelled shotgun . . . 





*Production of a two-seat training version of the Lightning was put in hand in 1956, the T.4 prototype, XL628 (seen here up from the SBAC show at Farnborough in 1959) making its first flight on May 6, 1959. Based on the single-seat F.1A, the T.4 retained the "witch's hat" fin; the later T.5 variant, as experienced by the author, was fitted with a cropped squared-off fin.*

TAH ARCHIVE

AS A JOURNALIST back in the 1960s I was careful to cultivate a friend at the Ministry of Defence, who could get me rides in some very nice aeroplanes. I had a long list, which included the Hawker Hunter, Hawker Siddeley Harrier, McDonnell Douglas F-4 Phantom and English Electric Lightning. The latter I thought was a "big ask". This was the RAF's front-line interceptor — a missile with a man in it — which could do twice the speed of sound in level flight. It was a ferocious-looking beast; a big aeroplane with its two Rolls-Royce Avon engines mounted not side-by-side but one on top of the other. It looked for all the world like a double-barrelled shotgun.

At the same time that the Lightning was in squadron service, work on Concorde was progressing at Filton. Airline passengers would soon be flying at twice the speed of sound and military pilots were doing it already. Of course, Concorde passengers would be sitting in air-conditioned luxury sipping champagne. But the angle of my prospective story was — what was it like to fly at twice the speed of sound?

### THE RIGHT STUFF

The only other journalist I knew who had ever been in the Lightning was Mac, a friend of mine. I phoned him. "Going in the Lightning? Lucky sod!", he said with a rather strange laugh. "Let

me give you a word of advice. For God's sake get your teeth fixed". I was about to ask him why when he said he had to go, gave another strange laugh and hung up.

My flight was approved in the winter of 1967. I was told to report to the RAF Aeromedical Training Centre at North Luffenham in Rutland, to see whether I was made of "The Right Stuff". Most of it was fairly routine; blood pressure, lungs, heart-rate etc. Medical types put me in a cubicle with headphones on and played me high- and low-pitched sounds. If you heard the sound you pressed a button, which was supposed to establish how fast your reaction times were. I was also told that I had to see the dentist, who was not very impressed and decided that I had to have two fillings right there and then.

Later, Mac called me on the telephone. "Did you get your teeth fixed?" I said I had. He told me a story which was enough to give anyone the willies. The Lightning had an astonishing climb rate, even by today's standards. It could reach 30,000ft (9,150m) in 1min. During take-off the reheat was engaged on both engines and a long orange flame roared out from the exhaust. The aircraft literally stood on its tail and went up vertically like a rocket. Mac, it had transpired, had some dodgy dental work, with two loose fillings. As the aircraft streaked into the stratosphere the change in pressure caused two



**LEFT** *"The waiting was the worst bit" — a trainee steels himself for a very brief but very fast ride on the ejection-seat trainer at West Malling in the early 1960s. The Lightning T.5 was fitted with a pair of state-of-the-art Martin-Baker Mk 2 4BSB ejection-seats. To date, some 332 lives have been saved by the use of the company's Mk 2 seat.* TAH ARCHIVE

fillings to blow clean out of his bottom jaw. This was made even worse by the fact that he was being violently airsick. So for the duration of his flight he sat there with a mouth full of amalgam and vomit.

I raised the matter with the RAF dentist. To him it was a familiar story. The British are not known for dental hygiene. In the bleak days of food-rationing after the war, children supplemented their diet with gobstoppers and similar cheap confectionery. Small wonder, then, that young people were sometimes fitted with false teeth in their twenties. The RAF dentist told me that exploding fillings were a common phenomenon in the RAF and potentially extremely dangerous. With the rapid change in pressure, a piece of amalgam could blow from the bottom jaw and lodge in the roof of the mouth, exerting pressure on the brain and even causing unconsciousness. There was good evidence that a number of unexplained accidents involving fighter aircraft had been caused by a rogue piece of amalgam. As a result, some British pilots had their teeth capped, like the Americans.

There were two more hurdles to overcome before the flight. One was to ride the ejection-seat trainer. This looked like a piece of railway track angled into the sky with a rocket-powered seat attached to its base. When you pulled the handle or D-ring between your legs it would accelerate you from 0 to 60 m.p.h. (100km/h) in

$\frac{1}{20}$ th of a second. Used incorrectly, it was a very good way of breaking your neck. You were carefully strapped in and then an explosive charge like a big brass shotgun cartridge was placed in a chamber behind your head. The safety pins were removed and waved in front of your face.

"I am now removing the safety pins, sir. The seat is now live . . ." said the sergeant with a malevolent smirk. It was the way he said "sir". But then all non-commissioned officers were sadists, and they always had it in for civilians — especially journalists. I was told to fix my eyes on the horizon and keep my chin up. Should one be looking down when the seat fired there was a good chance you would dislodge a few vertebrae. The waiting was the worst bit.

You place your right hand over the wrist of your left and grasp the handle firmly. On the command "Eject", you pull it briskly towards you and — boom! In a fraction of a second you have travelled to the top of the rails and your further progress appears to have been stopped by a ratchet mechanism. There is a puff of smoke, a whiff of cordite and it's all over.

### **"GETTING A LITTLE ODD . . ."**

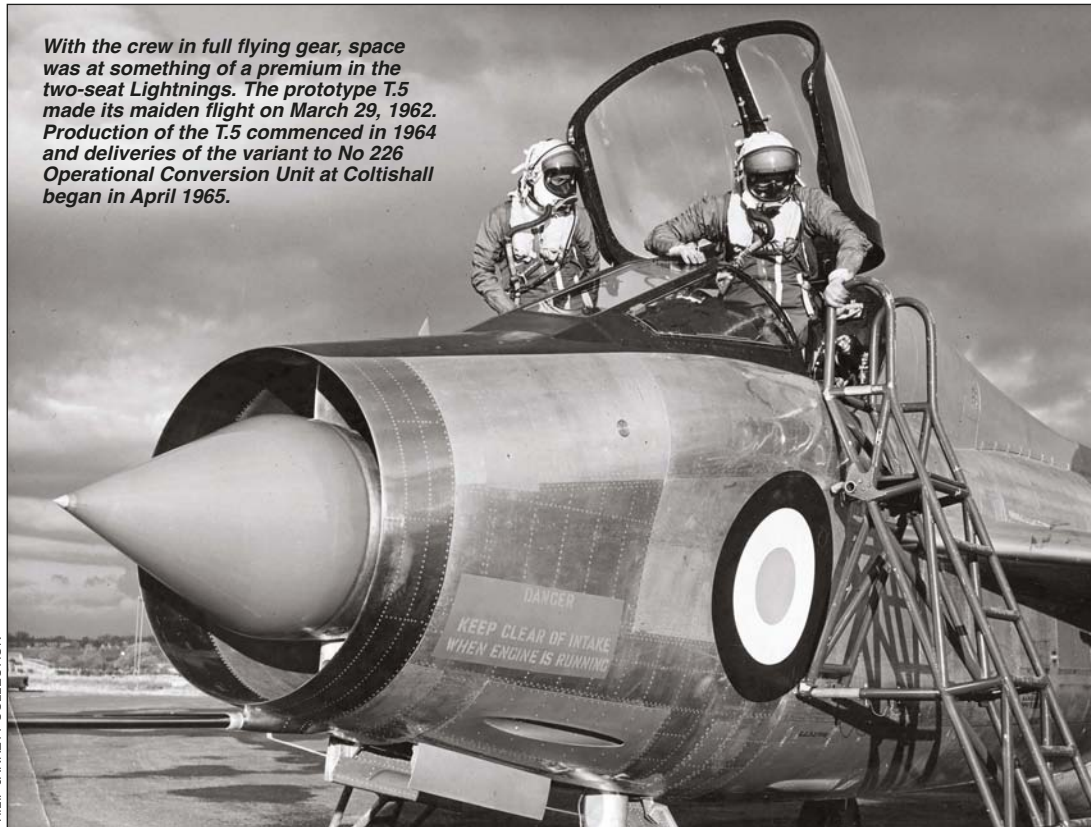
After this, the decompression chamber was easy. Six of us were made to sit in what looks like a small submarine with windows. We were all kitted out in flying helmets and oxygen masks. The engineers then simulated a rapid decompression and the chamber filled with fog. This is what would happen if the pressurisation failed on the aircraft — in other words, if the canopy was holed. The aeromedical boys observed us carefully.

At one point in the process we were starved of oxygen, at which point people started getting a little odd. Like scuba divers, we were suffering from nitrogen narcosis. When this happens there is a tendency to laugh and behave irrationally. Unfortunately you are not aware that you are making a prat of yourself. We were given a notepad and told to write our names on it. When the oxygen was restored I found that I had written meaningless scribble. Later they showed us a film of pilots behaving oddly under the effects of hypoxia.

I was told that if I should catch a cold or have any obstruction in my ears or nasal passages I would not be allowed to fly. If the aircraft had a



With the crew in full flying gear, space was at something of a premium in the two-seat Lightnings. The prototype T.5 made its maiden flight on March 29, 1962. Production of the T.5 commenced in 1964 and deliveries of the variant to No 226 Operational Conversion Unit at Coltishall began in April 1965.



**ABOVE** The author (right) and Sqn Ldr St Aubyn at RAF Binbrook. St Aubyn ejected from Supermarine Swift FR.5 XD928 in April 1959 while serving with No 2 Sqn at Jever. "I was in the sea for about half an hour", he explained. "It was cold, wet and rather unpleasant".



PHILIP JARRETT COLLECTION

A line-up of No 5 Sqn Lightnings at a typically rainy Binbrook, with the author's mount, T.5 XS451, nearest the camera. The unit received its first Lightnings in October 1965, having previously operated all-weather Gloster Javelins in West Germany from 1960.



rapid decompression at 40,000ft (12,200m) we would have to descend very quickly. Without oxygen at that height we would be dead in 5sec.

### **THE FRIGHTENING**

The Lightning. Some people called it the Frightening. Nobody who has flown in a Lightning is ever the same again. Many British aircraft were elegant — not this one. In no sense was the Lightning beautiful. It looked like the Angel of Death. It was designed to chase away the Soviets in their lumbering bombers. It was ballsy and functional.

Pilots were excited by the Lightning, a far more powerful machine than the Hunter. It was very fast with a snappy rate of roll owing to its short wingspan. A Lightning had no great trouble performing a dash to 60,000ft (18,300m) and some may have unofficially reached 78,000ft (23,800m), at which point it was no doubt as aerodynamic as a brick. [See *Surprise, Surprise in TAH1, which details Lightning interception trials against the Lockheed U-2 in 1962 — Ed.*] The Lightning could climb like a rocket but ran out of juice very rapidly. It was a Jaguar D-Type on steroids. It was The Rolling Stones in surround-sound after eight gallons of LSD.

I was told to report to RAF Binbrook in Lincolnshire, home to No 5 Sqn, which carried a maple leaf on the fins of its aircraft, on December 14, 1967. It was cold and wet and the days were

short. Another potential hazard was the prospect of ejecting from the aircraft and coming down in the North Sea. In winter the sea temperature is such that you would die of exposure in about 3min. So in addition to a g-suit and flying overalls, I had to wear a cold-water immersion suit — a large rubber affair which sealed around the neck. Thus, trussed like a chicken, it was time to be strapped into Lightning T.5 XS451. Strapping-in was a complicated business. There was a full harness and leg restraints, the latter attaching to the bottoms of your legs. If an ejection had to be made, the straps would automatically pull the feet back hard into the seat, in theory ensuring you didn't leave them behind in the aircraft.

The strapping-in went on forever. The strapper had to retrieve the harness and make sure it was tight. By the time it was all finished I was so restricted for movement that it was difficult to turn my head and look back along the wing.

My pilot was Sqn Ldr Bernard "Bunny" St Aubyn, a serious, quietly-spoken chap who had previously flown Hunters and Supermarine Swifts at Jever in West Germany. "We can get anywhere in Western Europe in the Lightning in about half an hour — but we won't necessarily get back", he informed me, as he swirled his finger to the groundcrew. The isopropyl-nitrate monopropellant (Avpin) engine-starting equipment in the spine of the aircraft kicked in



and the Avon engines spooled up. Avpin is a nasty, toxic substance that can burn without oxygen. I was glad it was nowhere near me.

There was enough isopropyl-nitrate for six starts. It was injected into the engine and ignited, which was enough to turn the engine over. The Avpin system was famously troublesome, but more reliable than ground-start systems, which might be hard to come by if Lightnings had to operate from remote airfields.

### **AWAY WE GO!**

We carefully taxied out, the Lightning being something of a handful on the ground. The high-pressure tyres could be skittish if the runway was wet, and the enormous fin was prone to weathercocking, meaning you could be blown off the runway by a Lincolnshire gale.

The take-off was sensational. Once we were lined up on the runway the two engines were brought up to full power and the brakes released. Bernard put the throttle through the gate and both afterburners lit up. A 25ft flame streaked from the rear of the aeroplane. It was like being kicked in the backside by a middle-aged camel with PMS. We went from zero to 100kt in 4sec; at 160kt we were airborne and climbing almost vertically.

The acceleration was breathtaking. We went supersonic in the climb, leaving a sonic boom somewhere over Skegness, and reached 30,000ft (9,150m) in a little more than a minute. In the aircraft you appear to be lying on your back with your legs stuck out as if they were in birthing stirrups. At this point a number of my amalgam fillings detached.

The Lightning was a thirsty beast; it leaked, dripped and smelt of fuel, and although it started the day with a full tank of fuel it very

quickly started emptying. The pilot was obsessed with how much juice he had and how far it would get him. Even flying subsonically the endurance of the Lightning was only an hour, hence the need to top up with juice from Handley Page Victor tankers patrolling the North Sea. It was called "bootlegging" and it could extend the endurance from 1hr to 3hr.

Soviet aircraft, such as the impressive Tupolev Tu-95 *Bear*, also patrolled the North Sea and frequently made incursions into British airspace. The Lightnings acted as policemen; they would be scrambled to intercept the bombers and chase them away but by the time they reached them the big Russian bombers had usually steered themselves back into international airspace.

We were hoping to find a *Bear* but it was not to be. Bernard told me that this happened several times a week. So much so that Lightning pilots often recognised the same Russian crew members. They waved to each other and on one occasion the observer in the rear gun position of the *Bear* held up a *Playboy* centrefold for the titillation of the Lightning pilot.

A mere 10min after tucking up the wheels, cruising at slightly less than the speed of sound, we were 100 miles away from home. It made you proud to be British. In those days the Yanks had nothing like it. Although we were flying in a two-seat trainer, the Lightning was designed as a single-seat interceptor, which resulted in a very high workload for the pilot. As soon as we levelled off Bernard was constantly talking to the ground radar station to plan our sortie. Today's air superiority fighters would have two people to do the job — a pilot plus a navigator/ weapons-systems operator.

On the upper starboard side of the instrument

*Lightning T.5 XS451 — unusually, without the belly fuel tank — awaits clearance for take-off from Binbrook on October 29, 1970. The aircraft made its first flight on June 3, 1965 at Samlesbury and joined No 5 Sqn that November. It was retired from RAF service in 1976 and later continued its flying career in South Africa as ZU-BEX. Sadly, it was lost in a fatal accident at an airshow at Overberg Air Force Base on November 14, 2009.*

ADRIAN M. BALCH COLLECTION







PHILIP JARRETT COLLECTION

**ABOVE** *The T.5 prototype carrying a pair of Red Top missiles. The two-seat Lightnings were every bit as agile as their single-seat counterparts, the author describing a hard turn at supersonic speed, during which his body became four times its normal weight, thus: “Weighing 50-stone is like having an elephant sitting on your neck . . .”*

panel was a small radar scope surrounded by rubber. Looking down it revealed a luminescent orange screen with a small blip on it advancing towards us at what seemed to be a terrific speed. The ground radar controller’s voice came through the headphones: “One bogey, port side, four miles, well clear”. “Its probably a Yank out of Upper Heyford”, said Bernard. By this time we had flown nearly to the coast of Norway, so we turned around and headed homeward.

Guided on to our target by the ever-closing blip on the radar we crept up on a McDonnell F-101 Voodoo up from the USAF base at Upper Heyford in Oxfordshire. We must have been at something like the speed of sound. I looked out over the starboard side of the instrument panel. “We’ll have visual soon. On your side”, explained Bernard.

There he was! A big aeroplane with swept wings going quite slowly. We crept up from below and behind and pounced on him. I had a fleeting glimpse of a big white star on the wing, then he was gone. He hadn’t seen us coming but he would probably see the flame from our afterburner as we departed.

## **HOMEWARD BOUND**

It was time to go home — we were almost out of gas. The weather was still appalling and we undertook a ground-controlled approach back into Binbrook, which was like having a wet sock pulled over your head while you were looking for your contact lenses. I couldn’t see a thing and

I felt sick. I knew enough not to throw up into the oxygen mask, so noting we were below 10,000ft (3,050m), I took it off. Bernard suggested that, if necessary, I should use one of my rather spiffy thin-leather gloves, which must have cost a fortune. As it happened the nausea passed and I had nothing to chuck anyway, having had no dinner the night before and not so much as a glass of water for breakfast.

Once again the ground-controller’s voice crackled through the headphones: “You are 100 miles from touchdown”. Almost in the same breath: “You are 70 miles from touchdown”. How fast were we still going? The mainwheels hit the ground with an enormous bang and the drogue parachute yanked us to a halt. We had been doing close to 200 m.p.h. (320km/h) when we touched down on Binbrook’s wet concrete.

The Lightning was supposed to be Britain’s last manned fighter aircraft. Its forerunner, the experimental P.1A, first flew in 1954 and variants of the type were still in service 30 years later. But even in old age it could still see off newer fighters like the Phantom and Dassault Mirage.

Late in the Lightning’s service life a relatively inexperienced USAF pilot in an F-16 tried to take on an RAF pilot in a Lightning F.3, and found that the “old dog” repeatedly frustrated his missile attacks. The American pilot blindly kept at it and was later asked what he was trying to accomplish. He replied: “I was trying to get alongside, open my canopy and club the son-of-a-bitch to death”.







# ARMCHAIR AVIATION

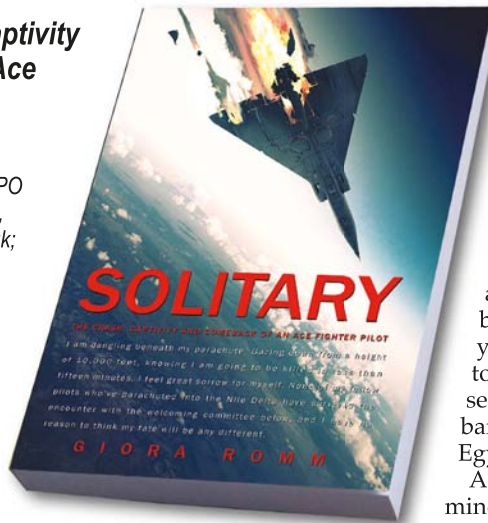
*We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics*

## **Solitary: The Crash, Captivity And Comeback Of An Ace Fighter Pilot**

By Giora Romm; Black Irish Entertainment, Ansonia Station, PO Box 237203, New York, NY, USA, available from [www.amazon.co.uk](http://www.amazon.co.uk); 6in x 9in (152mm x 229mm); softback; 302 pages, illustrated; £9.99. ISBN 978-1-93689-128-3

COMBAT VETERANS of all conflicts share one overriding fear — capture by the enemy and a lengthy imprisonment. In the second half of the 20th Century there were many examples of such ill-fortune, especially during the Vietnam War, during which hundreds of Americans, mainly aviators, were incarcerated in North Vietnam for long periods, sometimes up to eight years. Beaten, tortured and starved almost to the point of death, these individuals had to reach way down within to survive. Some could not, and died in the solitary confines of the infamous Hanoi Hilton or other North Vietnamese prisons. While these Americans languished, other captives elsewhere were experiencing a similarly torturous existence.

By 1969, Captain (later Maj-Gen) Giora Romm of the Israeli Air Force (IAF) had already seen a lot of action, becoming Israel's first fighter ace during the 1967 Six-Day War by shooting down five Egyptian and Syrian MiGs during that brief but intense conflict. On September 11, 1969, Romm's Dassault Mirage IIICJ was struck by an Egyptian MiG's cannon fire over Egypt and he had to eject at 20,000ft (6,100m), an unusually high — and potentially dangerous — altitude at which to "step out". He was badly injured and, as he floated down, realised that he was heading directly towards a growing group of angry



Egyptian farmers.

After several intense moments of confrontation during which he feared for his life, he was rescued by army troops to begin a lengthy stay with the Egyptians. Not only were there the expected language problems, but also the obvious animosity between the two cultures. The young Israeli pilot struggled to maintain his dignity and security against a constant barrage of questions from Egyptian officers.

As well as being a tough-minded, fast-acting fighter pilot, Romm also has a more cerebral side, frequently questioning the

order of the world around him and why things happen. This highly personal memoir covers a very specific five-month period in which he was forced to endure all the physical and mental hardships associated with this most stressful of military experiences. Romm is a very private man, and to write these extremely personal stories of his medical and physical torture at the hands of the Egyptians must have taken a great deal of psychological and emotional fortitude.

At this point of the book there is very little about aviation, except for the fact that he is constantly reminding himself that he is an officer in the Israeli Air Force — an ace, no less — and that it is up to him and him alone to maintain that dignity, even though his physical and mental state may not seem able to support it.

Much of the narrative revolves around the daily contest between Romm and his guards, his struggle to maintain his officer identity, while trying to get medical attention and adequate food, as well as organise a meeting with a Red Cross representative, if only to get word back to his family that he was alive.

On December 6, 1969, he was transported to

a location from which he was released into the hands of a Red Cross official and ultimately brought home to his anxious family and friends and country, where he was fêted as a returning hero. He began rehabilitation, all the while focusing on returning to flight status, something those around him were not sure he would be able to accomplish. But he did, in time to participate in the 1973 Yom Kippur War as the commanding officer of a Douglas A-4 Skyhawk squadron. The Egyptians learned that Romm

was again in the cockpit, flying against them, and they broadcast a message to tell him they were waiting for him. This time, they said, his reception would not be as "benevolent" as the first.

Romm's description of flying the Skyhawk, a much different aircraft from his delta-winged Mirage, and of learning to lead his squadron of eager young men in an increasingly bloody and intense war appears rather suddenly. It was only after he took a long, hard look at himself and how he felt, that he was able to settle into the assignment given him by high-ranking IAF officers who needed his help, personality and experience. This last section provides plenty of detail about flying in the 1973 war that has never been offered in other such memoirs. It is well worth reading.

*Solitary* is the story of one man's journey from the highs of flying at 20,000ft in pursuit of his country's enemies to the very personal depths of the type of incarceration few men have had to experience. It is a journey well worth taking.

**PETER B. MERSKY**

### **Windsock Centenary Datafile No 163: RAF B.E.2/B.E.2a/B.E.2b**

By Paul R. Hare; Albatros Productions, 10 Long View, Chiltern Park Estate, Berkhamsted, Herts HP4 1BY; 8¼in x 11¼in (210mm x 297mm);



softback; 36 pages, illustrated; £11.80 + p&p, available direct via [www.windsockdatafile.co.uk](http://www.windsockdatafile.co.uk). ISBN 978-1-90679-835-2

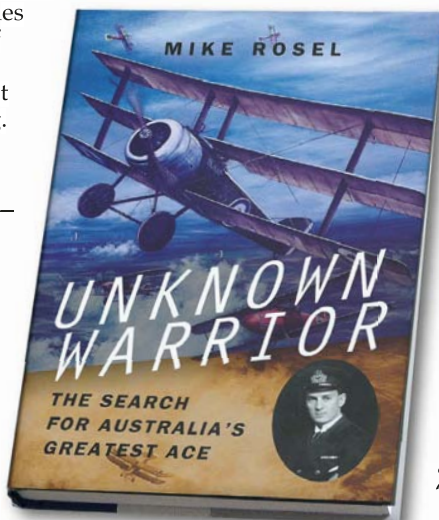
LINKING IN WELL with Adrian Roberts's article on E.T. Busk in this issue of *TAH*, this addition to the respected *Windsock Datafile* stable is the first one published to mark the 100th anniversary of the onset of World War One. The author specialises in Royal Aircraft Factory types, and provides a decent account of the Factory's first B.E. series, within the space

constraints of the slim format.

Illustrations and captions make up the bulk of the content, however. There are plenty of rare and well-reproduced black-and-white photographs, although equally there are quite a few which lack contrast, resulting in a rather inconsistent overall appearance through the book. The inside covers feature good colour photographs of the RAF Museum's B.E.2b reproduction at Hendon, and the back cover is adorned with excellent colour side-views by Ronny Bar.

The real stars of the show for this reviewer, however, are the fine, crisp scale drawings by Mick Davis. Extending to 11 pages, a third of the volume, they are executed in 1/48th and 1/72nd scales and will surely make the heart of any scale modeller soar.

**MICK OAKEY**



### **Unknown Warrior: The Search For Australia's Greatest Ace**

By Mike Rosel; Pen & Sword Books, 47 Church Street, Barnsley, South Yorkshire S70 2AS; 6in x 9in (152mm x 236mm); hardback; 144 pages; illustrated; £19.99. ISBN 978-1-78346-394-7

THIS BIOGRAPHY OF Robert Alexander Little from Pen & Sword is a British issue of a book originally published "down under" in 2012 by

Australian Scholarly Publishing Pty Ltd. Accordingly, it includes a brief update on the recent discovery of Little's flying helmet and other effects in Australia.

Mike Rosel feels passionately about Little's memory. It could be said that virtually every World War One ace, indeed virtually every Great War casualty, is "unknown" today except to specialist historians and descendants; Rosel's point is that Australian post-war histories have largely focused on those who served with the Australian Imperial Forces, and largely ignored those, such as Little, who served with British forces.

Was Little "Australia's Greatest Ace"? He is usually considered to have the highest victory score, although even this has been challenged. Supporters of his countryman Roderic Dallas would say that the latter was by far the better leader and tactician. Little was popular with his comrades and was a brave, if often reckless, individualist. His skill lay in being a superb shot with exceptional eyesight. Little and Dallas could be compared with British pilots Albert Ball and James McCudden respectively. It was ironic, therefore, that Little's death was from a random bullet fired into the night, possibly by a Gotha gunner, but it was more likely "friendly fire" from the ground.

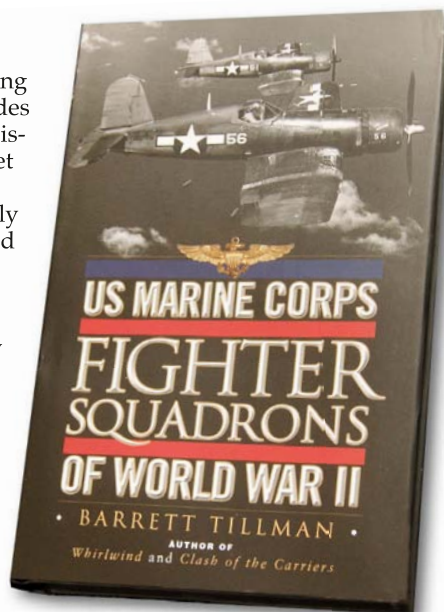
*Unknown Warrior* is a slim book with a considerable amount of padding. Admittedly, it is a difficult task to write a full-length book about a young man who died aged 22 and left virtually no written record of his own. There are no letters, few school reports and only some of his logbooks and combat reports survive. The author does acknowledge this problem, and has chosen to include chapters on the social history of Australia, Little's school and on the nation's remembrance of the war. The chapter on his flying training relies heavily on accounts from other pilots of their experiences. The longest chapters are about Little's career as a scout pilot, and this is where more substance is most needed. It surely must be possible to identify more of his German victims.

Little was away from the front and living in Dover from the end of July 1917 until March 1918, but we are not told what he was doing — are we to assume he was on leave the whole time? There are also several editing glitches (the same quote used twice), as well as some

rather dubious "facts".

It is commendable that the author has gone to such great lengths to revive Little's memory, but one gets the feeling that the book is intended to inspire and educate young people rather than being aimed at historians and specialists. In the former role, it should work well, while for the latter, it may fill a few gaps in the knowledge of some enthusiasts.

ADRIAN ROBERTS



## ***US Marine Corps Fighter Squadrons of World War II***

By Barrett Tillman; Osprey Publishing, Midland House, West Way, Botley, Oxford OX2 0PH; 6in x 9in (152mm x 229mm); hardback; 272 pages, illustrated; £20. ISBN 978-1-78200-410-3

THE ARRIVAL OF a new book by Barrett Tillman is always of interest. He is one of the most seasoned aviation historians in the business. As much as I have written about US Marine Corps (USMC) aviation, I can always learn something from whatever Tillman writes, and this new book is no exception.

Having admired the book's attractive jacket, the reader is given a quick introduction to the history and aircraft of the "flying leathernecks". Then, in typical Tillman style, he gets into the specifics regarding individual aviator biographies and unit histories that, no matter how often you may have heard or read them, yield new information or a different, highly entertaining insight into the facts.

This volume is a welcome companion to Tillman's 1997 book for Specialty Press, *US Navy Fighter Squadrons in World War II*, a valuable reference on the subject. This new tome on Marine Corps squadrons includes tables, photographs, "aceology" facts and figures in 24 appendices that will satisfy any enthusiast and/or historian. There is also a transcription of an April 1943 interview with Captain Joe Foss, the leading USMC ace, which provides valuable contemporary references and opinions on tactics, enemy equipment and general conduct of the war in the Pacific. Tillman even sounds off in his inimitable style about the ongoing debate as to who really is the top USMC ace, Foss or Gregory



"Pappy" Boyington.

With 160 photographs showing aircraft and personalities (including some rare colour and 12 pages of colour USMC badges and insignia), this new addition to the ever-expanding oeuvre of US Marine Corps aviation writing is sure to please on many levels.

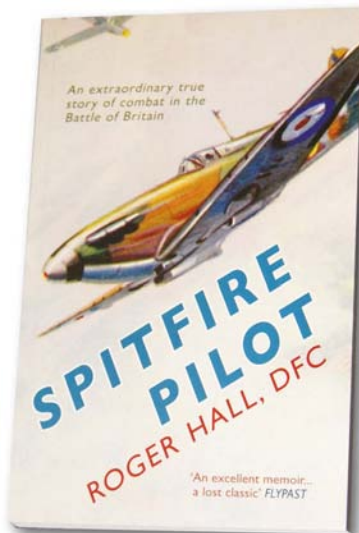
PETER B. MERSKY

## Spitfire Pilot

By Roger Hall DFC; Amberley Publishing, The Hill, Stroud, Glos GL5 4EP; 4¾in x 7¾in (124mm x 198mm); softback; 192 pages, illustrated; £9.99. ISBN 978-1-44561-684-1

SINCE THE LATE 1940s there have been numerous autobiographies written by pilots who served in Fighter Command during the Battle of Britain and other operations, both at home and abroad, during World War Two. They detail their experiences, but often write in a style which uses an impersonal, almost clinical, approach, especially in the description of aerial combat, and the reader is given only a fleeting glimpse of the thoughts, feelings and fears that pilots experienced.

Roger Hall completed his pilot training in August 1940, just as the Battle of Britain was reaching its peak, and it is apparent from the content of this book that he kept a comprehensive diary, which reflected his sensitive nature, and on which he drew at the end of the war, to prepare the original manuscript. So detailed was that manuscript that the editor set himself the formidable task of cutting it down to one third its length. [*The final manuscript became Clouds of Fear, first published in 1975, and of which Spitfire Pilot is an abbreviated version — Ed.*] What remains is one of the most original autobiographies of any pilot, for he describes in detail not just what was passing through his thoughts and emotions, but paints evocative pictures of what he saw from the cockpit of his Spitfire. On one occasion, when climbing to a position



ready to intercept enemy aircraft, he lyrically noted "wisps of cirrus, now turned silver, high above us".

When relating combat, his use of language is equally descriptive, such as the picture of a German bomber which "levelled out of its turn as if to say it had had enough". It is apparent that he did not view the shooting-down of enemy aircraft as something impersonal, which some pilots had to do in order to be able to take part in combat. He does not hold back from revealing his innermost thoughts and

growing fears about the role demanded of him, and, in particular, confesses to being deeply affected by undertaking ground-attack sorties in 1942. On one operation, following the strafing of a German column, he notes that "the road was stained by pools of blood which increased in size as we came down again. I began to feel a terrible revulsion for what I was doing. However much I tried to hate the Germans, I ended by despising myself". Not long after this event, Hall suffered an emotional and nervous breakdown, no doubt brought about by deep inner conflict; his flying days were over.

This is a truly candid narrative of one man's war, and is stripped of the veneer of glory often found in other accounts. The author's honesty and openness make this a moving, personal story which reveals true heroism and gives greater depth and understanding to the demands made upon aircrew and the emotional

lengths to which they had to go in order to perform their duties. This book, which is highly recommended, graphically illustrates the personal relevance of Churchill's tribute to each and every pilot who was one of "The Few".

FRED CROSSKEY



## Irish Aviators of World War I: Volume 1, Irish Aces

By Joe Gleeson; self-published via [www.CreateSpace.com](http://www.CreateSpace.com); 6in x 9in (152mm x 229mm); softback; 531 pages,

*illustrated; the print edition is available via Amazon for £14.92, and a Kindle digital version is £6.76. ISBN 978-1-48008-232-8*

IN THIS, THE first of three self-published volumes covering First World War Irish aviators, the author concentrates on aces; the succeeding volumes will cover all other Irish aviators in the RNAS and the RFC/RAF. A grand total of 6,000 served in these Services, and the author's expressed aim is to "attempt to address the enormous contribution made by Irish aviators during the Great War". It is a formidable task, but this volume makes a good start.

The book opens with an introduction to the whole work, which explains the rationale behind it and includes sections relating to each specific volume. One point worthy of note is how the author defines an Irish ace; only 31 of the 37 aces in this volume were born in Ireland, and some of those with Irish parents have been included, the author having taken the "ultra-minimal approach to the Irish community abroad".

Part 1, the main body of the book, provides biographies of the 37 Irish aces. These vary greatly in length, depending on the material available and the survival time of the person concerned. Prominent pilots such as Mannock and McElroy have a greater share of the pages, but it is good to see space devoted to other familiar names who have had less attention devoted to them, such as "Poppy" Pope, who later, as an Aeroplane & Armament Experimental Establishment test pilot, had a nasty experience in one of the Parnall Pipits and who also served with distinction in the Second World War. Likewise there are good accounts of the service careers and combats of far lesser-known pilots, and sources are cited either in the text or as footnotes.

In Part 2 the author gives briefer biographies of 11 "unconfirmed Irish aces" and the book ends with two appendices, "data regarding aerial victories" and "excluded aces — persons of Irish parentage or Irish ancestry", and a bibliography. The first appendix is rather curiously divided into a series of five tables under respective aircraft types, but this excludes some of the aircraft in a listing of Irish aces' victories by aircraft type on page XXI at the front of the book.

Illustrations are limited to eight pages of monochrome images of aces and aircraft (but not the actual machines flown by some of the aces) in the middle of the book. Although they are printed on the same soft paper as the text they have come out quite well, but a few more would have been good. Nevertheless, the price is excellent for such an impressive piece of work.

**PHILIP JARRETT**



# BOOKS IN BRIEF

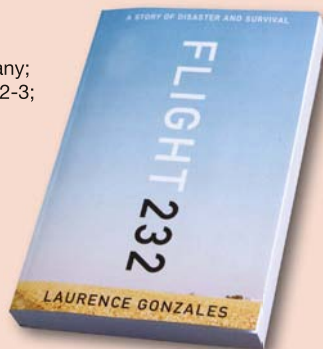
*A quick round-up of what else is available for the aviation history enthusiast...*

## **FLIGHT 232**

**Laurence Gonzales**

W.W. Norton & Company;  
ISBN 978-0-39324-002-3;  
RRP £16.99

AN EXTREMELY detailed and highly readable account of the horrific crash of United Airlines DC-10 N1819U at Sioux City, Iowa, on July 19, 1989. The author leaves no stone unturned to deliver the definitive tome on the catastrophic sequence of events which culminated in 184 of 296 passengers miraculously walking away from every air-traveller's worst nightmare.

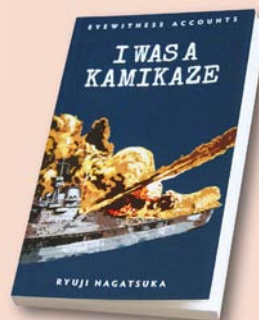


## **I WAS A KAMIKAZE**

**Ryuji Nagatsuka**

Amberley Publishing; ISBN  
978-1-44563-482-1;  
RRP £8.99

A welcome reissue of the wartime recollections of Imperial Japanese Army Air Force pilot Ryuji Nagatsuka, first published in French in 1972 and in English the following year (but, curiously, never published in the author's native tongue). Divided into three parts — flight training in 1944, combat against B-29s and Nagatsuka's voluntary posting to a kamikaze unit — the book provides moving insight into what it was like to fight a war that was already lost.



## **ON THE WINGS OF HISTORY**

**Allan Udy and Alex Mitchell**

Historical Aviation Film Unit;  
ISBN 978-0-47325-591-6;  
RRP £16.99

A beautifully illustrated guide to the enviable wealth of immaculate Great War-era aircraft restorations and reproductions established in New Zealand by The Vintage Aviator Ltd, *OTWOH* is rough around the edges but clearly a labour of love.



# Lost & Found

**PHILIP JARRETT** explores the lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. Here he investigates a rare photograph of an oriental Ryan Brougham a long way from home in 1929

**C**HARLES LINDBERGH'S SOLO non-stop transatlantic flight from New York to Paris in May 1927 aroused worldwide interest in the Ryan monoplanes. During the late 1920s and early 1930s several Ryan B.1 Brougham monoplanes powered by the 220 h.p. Wright J-5 radial engine were sold to China. In that country the American manufacturer was represented by Shanghai agents L.E. Gale & Co, and pilot Earl F. Baskey was attached to the company to help sell the aircraft.

The B-1 depicted here was photographed at Kai Tak, Hong Kong, and the print bears the pencilled inscription: "Ryan Monoplane (American) belonging to Chinese Air Force & built up at our 'drome at Kai Tak". The only visible markings on the aircraft appear on the rudder, in the form of the winged-M logo of the Mahoney Aircraft Corporation, with the words: "RYAN B.1. made by Mahoney Aircraft Corp. San Diego Calif. St. Louis Mo." beneath. In late 1928 production of the Mahoney Broughams at San Diego ceased and they were subsequently built by the Mahoney-Ryan Corporation at St Louis, so this particular machine was one of the last off Mahoney's San Diego line.

It is believed to be c/n 178 (ex-US registration

NC7730), sold on February 11, 1929, as one of two ordered by the Provincial Government of Yunnan at a cost of \$34,000, ostensibly for use in establishing a civil air service between the provinces of Yunnan and Kwangtung. (Intended civilian use was often professed with regard to aircraft being imported into China via Hong Kong at this time, to avoid various embargoes, but most ended up with military organisations.) The other was a six-seat B.5 floatplane model.

In April 1929 the B.1 landplane for Yunnan arrived at Hong Kong, where it was assembled under Baskey's supervision and named *Kunming*. It made several trial flights, carrying the American Consul General and friends on one occasion. It was intended to fly this machine from Hong Kong to Canton and then on to Yunnanfu, and it was indeed flown to Yunnan on April 27 that year.

## Mystery solved!

Thanks to Eric Harlin and especially Mick Davis of Cross & Cockade International, the airfield depicted in *Lost & Found* in *TAH7* has been identified. Mick Davis provided layout diagrams that show beyond doubt that the location is Upavon in Wiltshire, viewed from the west-north-west.



**The Ryan B.1 Brougham destined for China at Kai Tak, Hong Kong, after assembly, probably in April 1929.**



# Alitalia's fab four

During 1963–67 Alitalia operated the world's only civil *ab initio* jet training school. The Italian national airline's four fully-instrumented Macchi MB.326Ds flew up to 12 hours per day for four years, training a generation of pilots who would go on to become the backbone of Alitalia well into the 21st Century, as Italian aviation historian **GREGORY ALEGI** relates

**I**N 1962, FACED with a pilot shortage that threatened to slow its expansion plans, Italy's national airline, Alitalia, decided to create the world's first civil jet-based *ab initio* training school. The airline would pay students a modest salary throughout the course and hire successful graduates. Such was the haste that the school, organised by Capt Marcello Mainetti, was officially opened on February 15, 1963, with no aircraft.

Italian aircraft manufacturer Aermacchi tendered a variant of its new MB.326 trainer, which was just beginning to enter service with the *Aeronautica Militare* (Italian Air Force — AM). Mainetti flew the new trainer at Rome-Fiumicino airport in February 1963, and a contract was signed by Alitalia on March 29, two weeks after the airline had defined its standard avionics fit, which included a Collins VHF omnidirectional radio range localiser (VOR-LOC); instrument landing system (ILS) and automatic direction-finding (ADF) equipment; a Bendix radio magnetic indicator (RMI) and marker-beacon system; a Sperry R-1 pictorial deviation indicator and dual Collins VHF radio equipment (transistorised, as Aermacchi noted proudly), plus an Aermacchi-designed intercom.

The contract was not without its challenges. Alitalia's requirement demanded unprecedented aircraft serviceability, which in turn required effective maintenance, support and logistics. The proposal engendered risk for both parties, the MB.326 at that point being largely unproven in service. The AM had received its first production MB.326 only in February

**MAIN PICTURE** One of the four Aermacchi MB.326D variants supplied to Alitalia from the early summer of 1963, I-ADIE is seen here at the Paris Air Salon in June 1965. The aircraft performed a memorable display in the hands of Aermacchi chief test pilot Guido Carestiato, whose demonstration included inverted flight with flaps and undercarriage down and an inverted spin. **MIKE STROUD**





**RIGHT** *Alitalia 9th Course student Nanni Pomanti steps from the cockpit of one of the MB.326Ds in 1966. Pomanti would go on to serve with Alitalia for 40 years, finally retiring as a Boeing 777 captain in 2004. He also enjoyed a parallel career as a photographer, becoming a regular contributor to Playboy and other lifestyle-oriented magazines.* CAPT NANNI POMANTI







**ABOVE** The four Alitalia jet trainers were all painted in the same extremely attractive colour scheme, with the Italian tricolore on the fin, white upper surfaces with blue two-tone cheatlines and the airline's name in a three-bar script, bare metal lower fuselage and Dayglo orange sections applied to the outer wings, tiptanks and tailplane.

1961, and began training the 43rd Reserve Officer Course on the type in March 1962.

The new MB.326D variant was unveiled in Alitalia colours in May 1963, still fitted with standard AM avionics, and the type was quickly certified by the *Registro Aeronautico Italiano* (RAI). Development flights were entrusted to the newly-appointed Aermacchi test pilot Massimo Ralli.

The school began its first course on February 15, 1963, more than three months before the delivery of the first MB.326D. Alitalia selected 105 from more than 400 applicants, who went to the airline's training centre at Fiumicino airport for intensive academic study, which covered 14 subjects (including English) over 658 hours of instruction, with frequent exams for various

licences. Extensive Link Trainer sessions were also included. On July 15, the first 35 students proceeded to Brindisi, where they were met by ten instructors under Capt Luigi Filippo Alonzo.

### THE FAST TRACK

The first MB.326D — I-ADIA, c/n 6291/61 — was delivered on May 27, and received its certificate of airworthiness four days later. It was soon followed by I-ADIE (c/n 6292/62) on June 3, I-ADIO (c/n 6293/63) on July 8 and I-ADIU (c/n 6294/64) on July 16. The aircraft were rushed to Brindisi, but were later returned to Varese for the relevant avionics upgrades.

The flying syllabus comprised 80 x 1hr sorties, half of which were solo, with students gradually

**The first of the MB.326Ds to be delivered, I-ADIE is seen here landing at Brindisi in the "heel" of Italy, where the consistently good weather and relative lack of air traffic allowed the Alitalia jet school to pursue its intensive training programme.**

CAPT NANNI POMANTI







**LEFT** Nanni Pomanti and a fellow student beside I-ADIO. The Alitalia training syllabus was similar to that of the military, but intensive aerial manoeuvring exercises were replaced with additional navigation training for the civil pilots. The latter were allowed a 6g manoeuvring limit, as opposed to 8g for the military.

**BELOW** The shoulder patch for the ninth – and penultimate – Alitalia jet-training course, held in 1966.

passing their 1st, 2nd (equivalent to today's PPL) and 3rd (CPL) licences. Successful students emerged from Brindisi as "Student 2nd Pilots" and returned to Fiumicino for additional ground school study, including further time on Link Trainers, before converting to the Sud-Est SE.210 Caravelle or Vickers Viscount.

The first course ended on July 15, 1964, with 48 graduates immediately offered positions as "2nd pilots", with a single stripe on their sleeves. Before the first graduations, Alitalia recruited further courses. The fifth course started at Fiumicino with 61 students in February 1964 and a year later graduated 21 pilots, all of whom were offered positions with Alitalia; all but one accepted.

With its exceptional weather and comparatively quiet airspace, Brindisi was ideal for Alitalia's rigorous schedule. During the first 30 months aircraft use averaged 4hr per day, with peaks of nine sorties over some 12hr 20min. In the first 42 months, I-ADIA flew 4,288hr, I-ADIE flew 3,503hr, I-ADIO flew 4,609hr and I-ADIU flew 4,138hr, which equated to some 98.5hr per month. By comparison, the MB.326s of the AM at Lecce flew about 200hr per year per aircraft.

The challenge for the Aermacchi support team was a blessing in disguise. Engine excluded, the MB.326D was found to require between 2½ and 3 man-hours of maintenance per flying hour. The time between overhauls, initially set at 800hr, was gradually increased to 1,800hr. At this level, major overhauls required 1½–2 man-hours per flying hour, which made for 4–5 maintenance hours overall, an exceptional result at the time. Reliability and availability were similarly high.

The MB.326D also proved very safe. In the first 23 months, the only major events were a gear-up landing and a damaged fuel system during a ground test. Sadly, I-ADIA, along with 9th Course student Franceschini, was lost in undetermined circumstances on December 12, 1966, during a solo night sortie.



## SCHOOL'S OUT

On all technical and operational counts, Brindisi was an unqualified success. In 1967, when the school had completed ten courses, flown almost 20,000 hours and trained 200 pilots, Alitalia closed it for financial reasons. Its graduates would go on to serve the company for some 40 years, in some cases becoming instructors themselves at the new Alitalia school in Alghero.

The three surviving MB.326Ds were sold to the AM, which in return allotted Alitalia a number of places in reserve officer flying courses. The MB.326Ds were reconfigured to AM standard and assigned to the Lecce jet school. In uniform, I-ADIE became MM.54266 (preserved at the Malignani technical high school in Udine since March 1980), I-ADIO became MM.54267 (now on guard duty at the Gallarate depot, near Milan) and I-ADIU became MM.54268, which was lost on September 1, 1972.

If only for a brief four years, Alitalia could boast the most progressive civil jet training scheme in the world.



*The author would like to thank Gianni Cattaneo, Fulvio Chianese, Walter Gori, Giancarlo Naldi, Nanni Pomanti and Giulio C. Valdonio for their help with this feature*

*Canberra B.20 A84-238 made its first flight on October 25, 1956, and was delivered to No 2 Sqn RAAF on November 9 the same year. After service in Vietnam it returned to Australia in February 1971 and continued to serve until 1985 when it was retired. It is now in poor condition on a frame, with the rear fuselage of A84-233, and bears the name Nilsson.*



AUTHOR'S PHOTOGRAPHS

# OFF THE BEATEN TRACK


*Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places*

**I**N 1949 ENGLISH Electric's B.3/45 project took the name Canberra and in 1950 plans were made for licence production of the type at Fisherman's Bend, near Melbourne, for 48 Mk 20s, a variant of the B.2, for the Royal Australian Air Force (RAAF). Home base was to be RAAF Amberley, just west of Brisbane.

On my first visit to Amberley, in 1988, a clutch of withdrawn Canberras seemed all that remained of the Mk 20s. Later I was surprised to hear of two more examples a few miles west on the Cunningham Highway. Hence, in 2014, they became a priority for a closer look.

Delivered in November 1956, A84-238 served with No 2 Sqn RAAF as part of the 35th Tactical Fighter Wing (TFW) at Phan Rang, Vietnam, from July 1969 to February 1971, scoring highly for accuracy on Viet Cong supply routes from Laos and along the Ho Chi Minh Trail under the guidance of Forward Air Controllers.

On its return to Australia it was modified for cartographic survey work before being withdrawn in 1982 and struck off charge in 1985. In June 1986 it was acquired by the Willowbank

Caravan Park with sister aircraft A84-248 that is now derelict in a nearby field. Mounted at an unusual angle that clearly shows the type's distinctive planform, this "Cranberry" certainly requires some care and attention. 

**BELOW** Canberra A84-248 (with rear fuselage of A84-230) in a field beside A84-238. To see the pair from above, put co-ordinates S27-671313, E152-68958 into the "Fly to" box in Google Earth.







Find news, film-clips, photos, comments and more on Facebook at [www.facebook.com/TheAviationHistorian](http://www.facebook.com/TheAviationHistorian) and Twitter @AvHistorian



## Coming up in future issues:

**Mustang Ridge Runners** Doug Gordon details the use of photo-recce RF-51Ds in Korea, and talks to the men who flew some of the most dangerous missions of the entire conflict

**Tell It To The Marines** Chris Farara and Lon Nordeen tell the full story of the US Marine Corps' procurement of the Hawker Siddeley AV-8A Harrier and its operational career

**Kill 'em, Chill 'em and Fly 'em Out** Australian National Airways' post-war "Air Beef" scheme was a remarkable aviation achievement, as Nick Stroud explains



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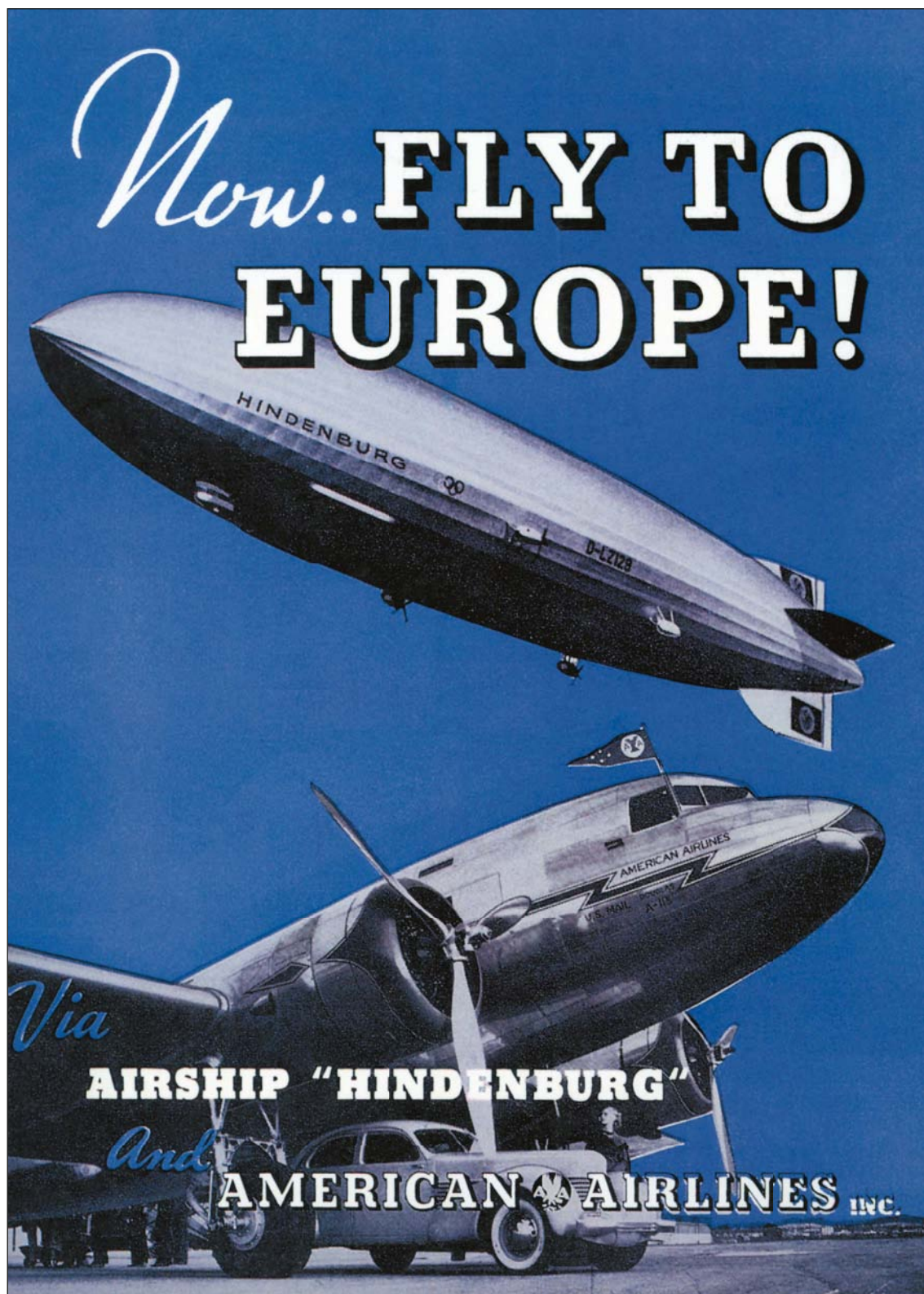
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A vintage advertisement for American Airlines. The top half features a large, silver Hindenburg airship flying diagonally across a clear blue sky. The name "HINDENBURG" and the registration "D-LZ128" are visible on its side. Below the airship, a silver DC-3 airplane is shown from a low angle, highlighting its propeller and engine. The text "AMERICAN AIRLINES" and "V.S. MAIL" are visible on the fuselage of the DC-3. A small flag with the American Airlines logo flies from the tail of the DC-3. In the foreground, a vintage car is partially visible. The background shows a flat landscape under a clear sky.

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